

# **Fundamentals of Neuropsychology**

**Dr. Nouri Jaffar  
Professor Emeritus  
Baghdad University**

1988

دكتور نوري جعفر dr. nouri jaffar

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# **Fundamentals of Neuropsychology**

by Dr. Nouri Jaffar  
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**It pleases me very much to dedicate this monograph to my  
friend and colleague Professor Kevin Connolly of the  
Department of Psychology, University of Sheffield with deep  
appreciation.**



# Corrigenda

Please read as follows

<u>Page</u>	<u>Line</u>	<u>Correction</u>
2	3	prematurely
4	2	separation
5	2	concomitantly
9	1	If we
12	8	separation
13	13	discourages even
15	18	daily at
16	1	books on psychology
21	11	derivative
23	12	as a grey
29	1	objects
31	15	animals,
32	3	which is
32	23	call off
37	8	work as
38	9	functionalism
42	24	exclusively from that
43	8	of nations
48	12	similar,
54	2	garrality
54	3	intonnation
55	4	Now

56	12	with the left
56	12	no firm
56	27	only
60	11	are tied
60	15	but also in
61	7	ever new
63	9	has been
63	20	world than
64	11	have clear
68	10	charge should
69	24	It not only let
70	13	the major blow
70	19	promote
71	11	than the
71	26	from the stock
72	1	stock of
72	24	Knowledge
75	9	thoughts of
75	11	child's lying
76	27	start
76	28	ones
78	1	blow which
81	18	differentiations are
81	26	automatic activity
83	28	in his
84	3	even in
86	12	notion that
92	5	psychologist,Row
94	29	intonnation
105	12	disagreement
109	11	of Gray



111	16	agent
111	27	nodes
122	22	scene
125	12	forgetting
135	3	this procedure
135	9	the possibility
135	9	through selection of
136	8	subjected
136	10	intonnation
139	2	state of
139	20	which in
141	21	depends
142	2	subcortical
144	18	aphasia
145	6	owes
150	7	abnormally
154	24	Regarding the human
155	7	the early stages
156	7	stimulation ceased
156	13	afflict
156	21	familiar
156	26	skills
156	29	mechanism
160	1	false



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## **Main References**



## **PREFACE**

**This monograph was long in preparation, and even now it cannot be considered complete. The general aim of the author is to acquaint the reader with the main principles of this new discipline and its educational implications. The book is in other words, an attempt to take as full as possible the latest findings of this highly complex branch of science. However, far be it from the author to think that the material of this book can offer an exhaustive presentation of neuropsychology; the author's basic aim is to offer points of departure which may serve as a stimulus for further and deeper elaboration of the subject. Therefore the author considers himself highly gratified if his modest ambition attracts the attention of others to keenly realize the significance of the subject which demands greatest efforts in making it available to students of psychology and education. The author also wishes to stress that he does not in any way consider his views indisputable.**



## *Chapter One*

# **General Historical Remarks**

- 1 -

Psychology is perhaps one of the most popular sciences in the world of today, at any rate among the humanities, it is not for nothing that the too bolder futurologists, albeit a little prematurely, have christened the 21st century the century of psychology. It goes without saying that psychologists all over the world sympathize with this reassuring forecast and are prepared to make it come true. It is of interest to note here that each specific period in the history of science has its "label". For example, in physics the 17th century was the age of mechanics, the late 19th and early 20th century was the time of electricity, and since the mid-20th century nuclear physics and electronics have fascinated the minds of the most talented people.

The term "psychology" came from the Greek "psyche" : "soul", and "logos" : word, and meant the "science of the soul". In ancient literature this term occurred as early as the 10th century, but was "officially" introduced by the German philosopher and psychologist Christian Wolff [1679-1754] comparatively recently, in the second half of the 18th century [1734], when psychology was set apart as an independent branch of knowledge. Attempts to

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gain an insight into the human "soul" ["psyche" or "mind"] date from time immemorial. The first systematic exposition of "psychological" facts was made by Aristotle [384-322 B.C.] who generalized the knowledge concerning man's "spiritual" or "psychical" life accumulated by that time. But, neuropsychologically speaking, neither man nor animals have any "soul". How then can there be a science about something that does not exist? However, the names of sciences formed historically; although their subject-matter continuously changes hence it would make no sense to change the names. Moreover, many sciences would have to be given new names. The subject matter of physics, for instance, is only part of natural science, although the term stems from Greek word "physics" - nature, while geometry has long since ceased to be concerned merely with land measure. On the other hand, the history of psychology is the history of the struggle of the philosophical interpretation of the human psyche [as an independant entity] and the physiological interpretation as a function of the human brain.

However, during the first fifty years after psychology split away from philosophy in the 1860's - 1870's and came into its own as an independant discipline, its subject-matter remained the psyche [the mind] of the individual as an entity existing outside time and social environment. It is of interest to point out here that just after the turn of this century the German psychologist Hermann Ebbinghaus [1850 - 1909] reflected that psychology "has a long past, but a short history". Until the period around 1880 to which Ebbinghaus was referring, psychology was not considered as an entirely independant scholarly discipline; rather, it was a facet of the human or moral field which was the "official" province of



traditional philosophy and the amateur pastime of any learned person.

The history of psychology is incredibly complex and dramatic; as indeed is psychology itself in the variety of layers that have always been presented in it. Perhaps the fact that should again be emphasized above all others is that psychology for a long time was merely as part of philosophy, there were philosophers of different trends who dealt with psychological problems. This means that, historically, psychology has never developed in a straight line. In 1874, for instance, the German psychologist and philosopher Franz Brentano [1838 - 1917] called for a creation of a single psychology in place of many psychologies which then existed under a common heading. Brentano was aware that this was a demand of the time, with which such sciences as mathematics, physics, chemistry and physiology had compiled a different point in time: the demand to identify universally recognized psychological trends. Brentano used to say that in science, like in politics, unification is impossible without struggle. Thus the road to the creation of a single trend in psychology was the road of struggle. The same tendency was also repeated in 1917 by another German psychologist William Stern [1871 - 1938]. In repeating Brentano's diagnosis, Stern was pointing out that inspite of the spectacular successes of precise psychological investigation, there were still many psychologies, not one psychology. But in the long period which separates these two statements, the crisis in psychology developed to such an extent as to reveal far more clearly the true historical task involved in uniting many psychologies into a single discipline.

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The principal flow in traditional psychologies concerns the complete separation of mind [psyche, self] from the body [organism]. This separation inevitably leads to a mechanistic approach to the analysis of the activity of the body and to a subjective interpretation of the nature of the mind. Thus, the problem of overcoming the ancient dualism between the mind and the body has to take place. However, the mere statement that the mind and the body form an integral unity does not automatically cause this dualism to disappear. That requires that the substance underlying their unity be identified. This means that the essential approach is to regard the mind not as a phenomenon that accompanies the life of the body, but as a process that realizes life itself. It should be viewed not as some subjective addition to the organism's activity, but as a form of that activity.

This new approach is extremely difficult. The division in question is so deep-seated that it has affected even our language. We have no word by which to name mind-body in a unified wholeness of operation. For if we said "human life" few would recognize that it is precisely the unity of the mind and the body in action to which we were referring. Consequently, when we discuss the matter, when we talk of the relations of mind and body and endeavour to establish their unity in human conduct, we still speak of body and mind and this unconsciously perpetuates the very division we are striving to deny.

It is almost a hundred years since psychology has been developing under the conditions of crisis in its theoretical foundations. The philosophy of psycho-physical parallelism,

according to which mental and physiological phenomena occur independantly of and concomittantly with each other, has become popular since the middle of last century. Since the beginning of our century, behaviourism has gained considerable ground in [American] psychology; this trend denies the existence of mind and reduces psychology to a mere study of behaviour as a result of the organism's response [reactions] to stimuli: the human organism is considered an automaton. Other psychologists, representatives of the so-called "functional psychology" held that the mind was divided into seperate independent functions. Others, gestalt psychologists, regarded every mental process as a configuration or pattern.

Neuropsychology delt a final blow to all these approaches, they assured in one way or another negatively or positively the mind body dualism in the science of man. In the light of neuropsychology, as it is detailed in this book, the path to an independent mind [intelligence, psyche, self] on its own right is thus cut off. After the scientific understanding of the organic and inorganic nature, and after scientific understanding of the social history of mankind there has come the turn for [neuro-] scientific understanding of the most difficult, complex and obscure element, the human mind.

It is important to note here that we frequently use phrases such as "unity in action," "wholeness of operation". What is implied in them gives the key to the problem. This is discussed below.

In just the degree in which action, behaviour, is made central, the traditional barriers between mind and body break down and

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dissolve. The habit of regarding the mental and the physical as separate things has its roots in regarding them as substances instead of as functions or processes and qualities of action. In contrast to such a notion, it is asserted here that when we take the standpoint of human action, of life in operation, body [especially the central nervous system] presents itself as the mechanism, the instrumentality of behaviour, and mind as its function, its fruit and consummation.

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As a result of the contradiction between the mass of factual material that psychology has scrupulously accumulated in excellently equipped laboratories and the pitiful condition of its unified theoretical basis has become even sharper. Negligence and scepticism in relation to the general theory of the psychological processes have become a barrier blocking the road to investigating the principal psychological problems. It is not difficult, therefore, to see the connection between this development and the disillusionment from unfounded claims of the major psychological trends [before the appearance of neuropsychology] that they would effect long-awaited theoretical revolution in psychology. When Behaviourism came into being, many psychologists spoke of it as a match about to light and to set off a keg of dynamite. After that it seemed that not Behaviourism but Gestalt psychology discovered a general principle capable of leading psychology out of the blind alley into which it was laid by rudimentary, "automistic" analysis [associatism]. Finally, very many psychologists had their heads turned by Freudism, as if in psychoanalysis Freud had found fulcrum that would make it possible to turn psychology right side up and make it really alive.

Other psychological directions were admittedly less pretentious, but the same fate awaited them from the standpoint of Neuropsychology. They all found themselves in the general eclectic soup that now being cooked by psychologists - each according to his own recipe - who have reputations of "broadmindedness".

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The author of this book adheres to the view that for the purpose of pinpointing the basic general trends in the present-day, psychological thinking concerning the multiplicity or pluralism of its trends or schools, that is, its central aspects, some of the details not fundamental for our task can well be sacrificed. The overall picture is needed if only for the purpose of correctly delineating the place occupied by a particular school. The idea has been to grasp the dynamics of the subject, to depict the evolution of the variety of the psychological thinking, to trace the rise of the basic trends in the field of psychology since the evolution of psychological thinking is made more complex, especially at the present time, the pluralism or the multiplicity of its traditional schools. And even when we grant that the hiving off into trends and schools as part of the development of science, we are forced to conclude that such multiplicity, such pluralism, as we find in this field, has reached a state of hypertrophy, became inflated out of all proportion. This situation is not without pitfalls for the unwary investigator. Confronted with an ever-swelling pluralism, he runs the risk of concentrating too much on a detailed classification of sub-viewpoints and sub-schools, on distinctions and nuances marking off one school from the other. Frequently, these distinctions, coming at a dozen or more removed from the

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subject-matter, has hardly any bearing at all on the really vital approaches. In the psychological literature on the subject, one frequently encounters psychological trends which, though brashly claiming originality, turn out to be more compilations, often of a highly eclectic nature, worked up from papers left by predecessors or supplied by fellow writers on the subject.

Clearly, it will be necessary to single out, as we shall do in this part of this book, the basic trends in the contemporary schools of psychology, the really important schools and teachings evolving from these trends and from the points where their thinking coincides.

An interesting point is that even in the works of those authors who make a thorough examination of these trends and schools the reasons for the pluralism are left unexplained. It is regarded as being self explanatory and in some instances is associated in somewhat shamefaced way with the "unending struggle for truth".

In point of fact, the pluralism of schools may be attributed to a whole series of interacting and closely related socio-historical and epistemological factors. These will now be briefly summarized.

It is possible to say that the variety of the traditional psychological doctrines and theories is a manifestation of the diversity of the social sources from which the psychological thinking itself stems, the presence within it of groupings, all differing in viewpoints and in psychological objectives.

We really grant that any attempt to ascribe the existence of multiform traditional psychological theories to the deliberate design or ill-will of their authors would be an oversimplification. However, this aspect should not be confused with another, namely, that of using the numerous schools that have already taken shape in the educative process in particular where the student or the teacher has to choose between alternatives all of which are equally wrong from the standpoint of neuropsychology. This is to say nothing of the fact that the multiplicity of interpretations of psychological facts, with one casting doubt on the other, must inevitably give rise to unbelief in the possibility of solving any psychological problem. Moreover, the history of the traditional psychological thinking is not without examples of particular situations in one or another country being used for plugging a "homogenous theory", it frequently happens that "fashionable" conception relegates the others to the background.

When we advance the historical factor as one of the reasons for the multiplicity of the traditional psychological schools, we have in mind two things: the supplanting of one theory by another in the course of the history of the traditional psychological thinking, and the specific historical features of the evolution of the psychological thinking in particular countries.

It is of interest to point out here that when a traditional psychological trend or school is deprived of its leading role as a result of change it may nevertheless carry on in much more modest circumstances. Having yielded ground to newcomers, and perhaps having abandoned the scene altogether, a traditional school may make a comeback and succeed in adapting itself to the

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changed social conditions. There have also been instances of a "revived" theory coming to the fore again and displaying much greater vigour than previously. It sometimes happens that the power of certain schools to survive is not based on the inner logic of development of science, not connected with increased knowledge of the subject and research in that particular field. Plurality also arises from the long life that traditional schools enjoy. As a rule, the more ancient the school the less monolithic it is, and the more elaborate its internal differentiation. It divides into two streams-one more conservative and stable, the other dynamic and tending towards a faster modifying process. And the greater the followers of the school, the more varied the moves with which it responds to social change, and the more eclectically it combines and links up with other trends in the psychological thought, quite frequently ending by branching up into sub-schools all claiming independence.

The plurality of schools is enhanced also by the influence exerted by those specifically historical national features which inevitably emerge in the development of psychological thinking generally. We have in mind that, due to the socio-historical and other features [including such factors as the national psychology, way of life, traditional forms in education and science] prevailing in one or another country, the psychological thinking there acquires specific forms of expression which, in time, give rise to a particular trend or home-made variance, thus adding to totality of the global trends. And these specifically historical features often play a highly significant role whenever another new theory makes its appearance. With the passage of time, the new theory takes the path of a relatively independent development, acquires a more



general form, and may accommodate itself to a situation quite different from that of its origin.

In the light of what has been said so far it is possible to compare modern psychologist to an architect having a tremendous quantity of building material but lacking a general or a comprehensive systematic theoretical plan. This statement is based on the discrepancy between the rapid accumulation of psychological facts and lack of psychological interpretation within a general theoretical framework. Nowhere is this discrepancy and confusion greater than in, what is precisely the most central and most decisive theme of psychology: the nature of human mental abilities. This means, in effect, that there is not in our contemporary situation an authoritatively accepted body of doctrines called "psychology" for which duly accredited spokesman can pretend to speak. There are psychologies and psychologists, and they differ psychologically on the fundamental problems of psychology. Pluralism of psychological systems must be regarded as historically transient forms of establishment of psychology as a science, that is, acknowledgement of the possibility and necessity of overcoming of this pluralism. In this sense a psychologist, who believes the continuing divergence of psychological systems to be the everlasting form of development of psychological knowledge, is morally bound to renounce the concept of psychology as a science. If such is his belief he must naturally rule out in principle any possibility of the development of psychology on collaborative basis, as in all other sciences. For such psychologist the deepening divergence of psychological doctrines is the highest manifestation of free psychological spirit, whose sole need is to assert itself.

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The divergence of psychological doctrines, however, has nothing in common with the denial of its necessity and progressive nature in certain historical context. In other words, the deepening divergence of psychological doctrines, the polarisation of psychology into different and even opposite systems of beliefs, played its positive role. That was necessary to the extent that humanity had to develop and try out a multitude of psychological hypotheses in order to subsequently accept as a basis, a point of departure, the one that found greatest confirmation in scientific data, and everyday and historical experience.

It is of interest to point out that a vast amount of busy research has gone in the developed countries, especially in the United States, during the last sixty years in dozens of different branches of psychology and pedagogy. But no common theoretical framework has been developed capable of integrating all of their results. The different branches of psychology have, thus, also been separate branches. Given the narrow conceptions about "scientific method" dominant in the behavioural sciences have proliferated into dozens of highly specialized and largely noninteracting, subdisciplines: the behavioural scientists have organized their research on the principle that the more narrowly and sharply defined a question can be, the more "scientific" it is. They see their empirical task as the pursuit of statistical correlations between the numerical values of "quantifiable" variables. The most salient feature of psychology today is the gaping abyss between the mountains of facts accumulated daily by the supermodern laboratories with up-to-the-minute equipment and the poor state of the theoretical foundations. Firms, the civil service, and the army in developed countries are all in a great hurry

to set up their psychological laboratories. A great deal of ingenious and useful work is being done. But psychology today is in urgent and acute need of a scientifically unified theoretical foundations without which even the best empirical foundations are inevitably myopic and unconnected to a single goal. This means that psychology today is increasingly preoccupied with empirical statistics than theoretical questions and is marked by differentiated rather than integrating tendencies.

The prominent American psychologist Kettle in his closing address to the Ninth International Congress of Psychology in the United States remarked that psychology is a huge jelly-fish which could do with "a few bones". The slogan "facts, only facts and nothing else" discourage, even the finest minds from tackling the cardinal questions of psychology. Many psychologists had even come to be proud of their lack of theoretical bearings and incoherent premises. This gave rise to an amazing phenomenon: separate chapters in books on psychology expressed different positions while the editor became the author. It is believed that this is the most fruitful approach. An amusing and revealing incident occurred recently: the editor of the translated book said a few warm words about the author in the foreward, characterizing him, among other things, as being, "exceedingly eclectic" in his exposition, since to him "eclecticism" meant "broad horizons, an ability to assimilate several different theories at once" he meant it as a compliment.

Scientific or non-scientific, such is the unavoidable alternative in psychology. These two trends are incompatible, and this is far more obvious today than at any time in the past. The need to solve

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the dilemma, that sums up the historical experience of psychological development, is recognition of the fact that there is no alternative to non-scientific but scientific psychology. All this does away with the superficial understanding of psychology as a labyrinth in which all paths are blind alleys. The choice which the psychologists [and to some extent anyone studying psychology] must make is ultimately a choice not between many but between two mutually exclusive decisions.

It is necessary to overcome the ordinary opposition of psychology and neurology as studying different "things". Although brain functions and mechanisms constitute an indisputable subject of neurology, it does not follow from this that these functions and mechanisms should remain outside the sphere of psychological investigations, that "what is Caesar's must be rendered unto Caesar". Actual relations connecting psychology and neurology are more like relations between neurology and biochemistry.

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Historically, psychology has never developed in a straight line. In 1874 Brentano, as previously stated, called for the creation of a single psychology in place of the many psychologies then existed under a common heading. He was aware that this was a demand of the times with which such sciences as mathematics, physics, chemistry and physiology compiled at different points in time: the demand to identify universally recognized scientific truth. Brentano used to say (stress again) that in science, like in politics, unification is impossible without struggle, thus the road to the creation of a simple science of psychology was the road of struggle. In 1917, William Stern repeated Brentano's diagnosis pointing out

that in spite of the spectacular successes of psychological investigation, there were still many psychologies, not one psychology. But in the long period which separates these two statements, the crisis in psychology developed to such an extent as to reveal more clearly the true historical tasks involved in uniting many psychologies into a single science.

A vast amount of busy research has gone on in the advanced countries during the last sixty years in dozens of different branches of psychology. But no common theoretical picture has been developed capable of integrating all their results. Psychology today is increasingly preoccupied with empirical studies rather than theoretical questions and is marked by differentiated rather than integrated tendencies. Prominent American psychologist Kettle in his closing address to the 9th International Congress of Psychology in the USA remarked that psychology is a huge jelly-fish which could do with a "few bones". This means that the most salient feature of psychology today is the gaping abyss between the mountain of facts accumulated daily as super modern laboratory with up-to-the-minute equipment and the poor, I would say, puny state of the theoretical foundations; Psychology today is in urgent and acute need of theoretical foundations, without which even the best empirical investigations are inevitably myopic, unconnected, and uncommitted to a single goal. The crisis in theory is not recent: psychology has existed in this unnatural state for a long time. The system of psychological knowledge is searching for "facts", only facts and nothing but facts discouraged even the finest minds from tackling the cardinal question of psychology. This gave rise to an amazing phenomenon: many psychologists had come to be proud of their lack of a psychological

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theory; separate chapters in books on books of psychology express different positions while the editor becomes the author.

It is of interest to point out here that from the contemporary trends in modern psychology one constantly hears loud arguments championing the advantages of pluralism compared with the unity of different views. If there are some sincere voices honestly seeking psychological truth among the general hubbly, they belong to psychologists who are barking up the wrong tree. A free exchange of psychological opinions [which are by no means a pure abstraction] is necessary precisely in order to achieve the unity of psychological thought that the very process of all scientific thinking presupposes. Freedom of psychological thought, important though it may be, has nothing in common with pluralism of psychological truth, that is, with a multiplicity of points of view all of which are to be regarded as true. According to some fashionable psychological trends, any unity of psychological approach is "repressive".

The word "pluralism" migrated to the page of the big newspapers from philosophy, invented by Wolf in the 18th century; the term was adopted by William James to express the right of every individual to have his own world view, an opinion about life not necessarily helped by others. Imagine a hotel with a large number of residents. In every room there is someone living his own life: a young man is writing poetry; a banker is counting his dividends; a scientist is investigating matter; a religious person is praying to God. No one is concerned with what is going on in the next room when they meet in the corridor the residents merely exchange polite greetings. The Neuro-psychologist prepared the

realm of psychological thought to such a hotel. Every psychologist has his own psychology. The ideal of integral objective psychological truth being naturally accepted by every psychologist seems platitudinous and embarrassing. After all what would a person feel like if he could not obtain a separate room in the hotel and had to share a room with a lot of other people?

Pluralism in psychology, produced at the end of the last century, has now been elevated into a program for contemporary psychology; and this does indeed resemble comfortably furnished hotel, where every psychological trend has its own separate room; they meet one another everyday on the staircase. Now and then there is some misunderstanding and noisy discussion. The reader is dazzled by strings of names and dozens of new terms. The hotel is a veritable pantheon of honour of a thousand gods, which was long ago ridiculed by Voltaire in his Maid of Orleans.

Why should it appear that when every group of voices is shouting its own song the melody of truth would be easier to hear? Of course, if truth is merely a matter of mental comfort, anyone with some means and a little psychological knowledge can satisfy his consumer interest at this supermarket of psychological ideas, where everyone is tolerant of everyone else, but the ultimate psychological result is what modern sociology calls "repressive tolerance". This excellent term puts the diversity of psychological trends on a par with Freudinism - old and new -, with Behaviourism [old and new], with the Gestalt psychology [old and new], of definitions of intelligence and intelligence testing, with "theories" of creativity, and so on. Wave after wave of "sensationalism" disorient students of psychology.

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The basic meaning of pluralism in psychology is that there exists a large number of viewpoints; they are all as true as one another. All are right in their own way, and all are "not transparent" for each other having a repressive effect on the brain of the student of psychology and pushes him towards loss of faith in the possibility of comparison or gradation amid such a chaos of psychological trends.

So, someone may ask: do you think psychological unanimity is better than multiplicity or pluralism? Of course, it is. But we should take our point of departure from the brain as the organ of the human psychological process. That means we should follow the facts that are provided by neuropsychology and leave aside all previous assumptions because all of them originated historically before the rise of this science of the brain which is based on neurosciences.



## *Chapter Two*

# **Neuropsychology: Its Main Assumptions**

- 1 -

To satisfy the condition of Neurology [physiology of the human brain] and psychology the term neuropsychology was coined. This term was apparently first used by D.O. Hebb [1904 - ] in a subtitle of his 1948's book:

The Organization of Behaviour  
- A Neuropsychological Theory -

The term was given wide publicity when it appeared in 1969, in the title of a collection of K.S. Lashley's [1890 - 1958] writings.

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Neuropsychology is organically connected with both neuro-sciences and socio-historical sciences. The specific tasks of psychology, from this standpoint, begin in connection with the transition to the study of human mental activity performed by the brain. Neuropsychology studying mental activity is one of the sciences about the human being. It is the science which reveals the laws governing the human psychological processes - intellectual and emotional - performed by the brain.

### *Neuropsychology: Its Main Assumptions*

The problem of the place of neuropsychology in the system of sciences is usually complicated by the attempts to solve it on the basis of opposing the neuro-sciences [natural sciences in general] to the socio-historical sciences, excluding any connection between them. Moreover, in the term "socio-historical sciences" the finer differences between "social sciences" proper and "historical" dealing with historically conditioned phenomena are effaced. Neuropsychology is one of the sciences about the nature of the human being, as a socially conditioned product of history. This conditions the connection of neuropsychology with neuro-sciences and with the socio-historical sciences.

Since psychological processes are performed by the brain they are subject to all laws of neuro-sciences, without these laws mental phenomena cannot be fully explained. Psychological investigation cannot be opposed to the physiological investigation of the brain or be isolated from it. Governed by the physiological laws of the brain mental phenomena may appear as merely or exclusively as the effect of the action of these laws, just as physiologic phenomena may appear as merely or exclusively as the effect of the action of the laws of biochemistry. However, physiologic processes are new specific form of manifestation of the laws of biochemistry and it is precisely this new specific form of their manifestation that appears in the laws of physiology. Mental phenomena are similarly a new, specific form of the manifestation of the physiologic laws of the brain, and their specificity is expressed in the laws of psychology. In other words, mental phenomena remain specific psychological processes and at the same time are a form of manifestation of physiologic laws just as physiologic phenomena remain and at the same time, as a result

of biochemical investigation, also appear as a form of manifestation of the laws of biochemistry. The laws of the lower levels of evolution are included in the higher spheres, but only as subordinate factor which does not determine their specificity. The leading laws of each sphere are its specific laws which determine the leading specific properties of the given sphere of phenomena.

This approach shows the untenability of a number of current formulations. The first obviously untenable formula is the one in which the mental and physiologic are regarded as coordinated aspects of one process. Its erroneousness consists in the fact that it disguises the hierarchy of the primary and the derivative, the basis and the form of its manifestation, which expresses the essence of the relations between the physiologic characteristics and the psychologic characteristics. Untenable also is the proposition which was sometimes opposed to the first assumption. According to this proposition, the physiologic and psychologic characteristics are serial "components" in which psychological characteristics are given to mental phenomena by psychology, while physiology limits itself to their specific [physiologic] characteristics. By its theoretical content this proposition expresses the concept of the old "physiologic psychology" which was mechanistic and philosophical. The arrangement of the physiologic and psychologic characteristics in series, or the inclusion of the former in the latter, leads to the fact that the physiologic characteristic of phenomena loses its effectiveness since in such serial arrangement of the physiologic and psychologic data of mental phenomena do not appear in their specificity as a new, specific form of manifestation of physiologic laws which is expressed in the laws of psychology. The search for the specificity of psychologic laws

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from this departure is therefore expressed in a fundamentally wrong opposition of psychologic laws to physiologic laws. Very widespread, but fallacious, is also the formula according to which the physiologic laws of the brain apply only to the material basis of the mental phenomena, while the psychologic laws apply to the mental phenomena which form a "superstructure" on this material physiologic basis. This formula is particularly harmful and dangerous because, by characterizing the physiologic laws governing physiological function of the brain as the "basis" of psychology, it appears, by its external expression, close to the neuropsychological concept of the correlation between the physiologic and psychologic laws. In reality, however, it expresses emphatic dualism. It establishes in the vertical direction [from the physiologic "basis" to mental phenomena which form a "superstructure" on it] the same external serialness between them as the preceding formula established in the "horizontal" direction. According to the meaning of this formula, the laws governing the physiological function of the brain do not apply at all to the mental phenomena, but only to their physiologic "basis", the physiologic phenomena. According to this formula, mental phenomena do not appear at all as a form of manifestation of the physiologic laws. The connection or correlation between them is severed.

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One of the most difficult problems, which confronted psychology for a long time concerning the correlation between psychology and the physiology of the brain, as already detailed, is, therefore, the problem of the connection of the physiological and psychological processes taking place in the brain. It is scarcely necessary at the present time to convince psychologists that the

brain is the organ of the psychological processes, and that all psychological phenomena [intellectual and emotional] processes must be studied in conjunction with the physiological processes. But what does it mean to study them in conjunction? For concrete psychological investigation the question is extremely complex. The fact is that no direct correlation between the psychological and physiological brain processes has solved the problem. Traditional alternatives that arise with such direct approach are already discussed. From the standpoint of neuropsychology, the physiological processes are the "performing" mechanisms of the psychological functions. The physiologist, for instance, sees the brain not as an organ of psychological processes, but as grey matter. He is confronted with morphological structures and physiological processes exclusively. The psychological functions of the brain disappear from his field of vision. It is obvious if we study only the anatomy and physiology of the brain we cannot get anywhere near explaining why, for instance, primitive people think differently from the people living at the present advanced society. The physiological characteristics of the brain do not determine the nature of the human mental processes. In effect, the psychological processes are not lodged in the brain. The brain virtually does not incorporate within itself distinctively any psychological function or ability. In other words, the brain amounts to be only one of the conditions necessary to develop psychological process, a condition, to be sure, which plays an important role in the formation of the psychological processes [as we shall detail in the next chapter of this book]. Thus, while psychological processes are not determined by the brain, they are nevertheless dependant on it. The brain is a necessary but not sufficient condition for the formation of the psychological processes.

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It is important to remember that when we are talking about what is reflected in the matter of the brain we are talking about the psychological or the mental, whereas if we are talking about how or in what way external influences are reflected in the brain, we are talking about the physiological. So the activity of the brain, from the standpoint of neuropsychology, is a unity of the physiological and the psychological. We define the activity of the brain as physiological when we speak of the brain as a physiological organ, when we study the functions of the matter of the brain, and as psychological when we study the contents of images and concepts reflected in it. That is why, for example, when a person looks at a tree, no matter how closely we study the physiology of his brain at that moment, we discover nothing resembling a tree in the specifically physiological processes we find in the brain.

Neuropsychology, as already stressed, tackles one of the difficult problems of psychology down the ages, the problem of correlation or connection between the psychological functions and the physiological mechanisms that carry them out in the human brain, on the one hand, and the influence of the social environment on the formation of the psychological processes of the individual, on the other hand. This means that neuropsychology is closely connected with both neuro-sciences and socio-historical sciences. It takes its point of departure, neurologically, from the fact that the brain is the physical organ of all human psychological function: mental as well as emotional. On the other hand, neuropsychology regards the contents of the brain as the product of socio-historical conditions. [Even the structure of the brain itself is a socio-historic product from the standpoint

of the process of evolution as we shall see in the next chapter]. This means that the role of the brain in the formation of the psychological processes in no way means acknowledging that these functions are hidden in the brain, but are formed in ontogeny [as well as in phylogeny] through the interaction with the existing conditions of the social life.

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Neuropsychology is not just a new branch [trend,school] of psychology, but a new historical stage presenting in itself the beginning of scientific psychology. It regards the brain as a whole galaxy enclosed in the cranium with billions upon billions of neurons [nerve cells]; each one of them has several thousands of contacts with the other nerve cells and sense organs. Besides, each neuron can be in at least six thousand different general states. It is therefore very difficult to imagine the number of possible specific states in which the brain can be given such a great number of variables. This means that the sum total of these contacts runs into an astronomical number of the degree of freedom in which the brain can use all of its potential. In other words, the actualized cortical functions or psychological processes are only an insignificant part of the brain fascinating potential; the human brain is full of unrealized opportunities at any given moment. Even men of genius do not utilize all their brain potential. The challenge is to enhance intellectual activity by using more resources which for the time being remain "hidden". As social life advances, the gap shrinks considerably between the brain's unlimited potential, on the one hand, and its actualization, on the other. This means that representatives of the most backward tribes, living at the present age, can easily enter the advanced

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modern life when they receive appropriate education and enjoy a suitable social life from early childhood; they can also contribute positively to the progress of mankind.

Neuropsychology takes as a basis of the analysis of the construction of the brain not the traditionally accepted division into anatomical parts but the new principle of the functional systems of a hierarchical order. It studies the cerebral basis of the human mental activity in an organic connection with the sciences such as neuroanatomy and neurophysiology. During the last few decades, neuropsychology has evolved with unforeseen rapidity. According to this approach the human mental processes are to be understood as complex functional systems having a socio-historical origin and exhibiting in their cerebral structure different levels of organization. These processes take place as a result of the combined activity of several cortical zones, each of which plays its own specific role in each one of these functional systems and supplies an essential factor for the normal working of the functional system as a whole. It is important to note here that our approach differs radically from the simplified psychomorphological approach of these neurophysiologists who have sought to narrow, circumscribed centres in the cerebral cortex in which each one of the complex psychological process is "localized", on the one hand, or who have postulated that the brain, the organ of the mind - works as a single, undifferentiated entity.

A detailed analysis of the three neuropsychological approaches mentioned above will be the subject of the next chapter of this book.



From the very beginning of its existence nearly half a century ago, neuropsychology has set itself the task of developing psychological science taking its contents from the assumption that the socio-historical condition of life constitutes the content of the human psychological processes (as well as from neuroscience regarding the brain as the physical organ of these processes, on the other).

The specific aim of this concluding section of this chapter is to show the impact of the social environment on different social groups in their different cultured levels and in the nature of their psychological processes. Over the centuries, philosophers, sociologists, anthropologists, linguists and social psychologists have all put forward "theories" linking the social environment [culture] and mind; and there appears, among other things, such terms as "primitive mind", "savage society", "uncivilized people", "inferior races" and the like. Concern with the cultural differences all too often took the form of comparisons [obvious or implied] between "uncivilized" people and "civilized" people in mother [European] countries. It is of interest to note here that some adventurers and missionaries from Western European countries of the sixteenth to eighteenth centuries even doubted that "uncivilized" people were really "human beings". This is due in principle to the fact that with the interests and occupations of a given society, certain things become objects of high esteem; others of aversion. The way a given society does things tends to determine the proper objects of attention of its members, and thus to prescribe the direction and limits of observation. What is strange or foreign [that is to say outside the activities of a given society] tends to be morally forbidden and intellectually suspect.

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It seems almost incredible to us, for example, that things which we know very well could have escaped recognition in past ages. We incline to account for it by attributing congenital stupidity to our forerunners and by assuming superior native intelligence on our own part; but the explanation is that their modes of life did not call attention to such facts, but held their minds riveted to other things.

A tribe, let us say, is warlike. The successes for which it strives, the achievements upon which it sets store, are connected with fighting and victory. The presence of this medium invites bellicose exhibition in the young, first in games, then in fact when he is strong enough. As he fights he wins approval and advancement; as he refrains, he is disliked, ridiculed, shut out from favourable recognition. It is not surprising that belligerent tendencies are strengthened at the expense of others. On the other hand, a child growing up in a family of musicians will inevitably have whatever tendencies he has to music stimulated and, relatively more than others which might have been awakened in another environment. Save as he takes an interest in music and gains a certain competency in it, he is "out of it"; he is unable to share a life in the group to which he belongs.

Careful study of different modes of social life has made it doubtful whether the native intellectual capacity of the "primitive people" are appreciably inferior to those of the "civilized societies". It has made it certain that native differences are not sufficient to account for the difference in culture. In a sense the mind of "savage peoples" is an effect, rather than a cause, of their backward social institutions. Their social activities are such to restrict their objects of attention and interest, and hence to limit the stimuli to

mental development. Even as regards the object that come within the scope of attention, primitive social customs tend to arrest observation and imagination upon qualities which do not fructify in the mind. Lack of control of natural forces means that a scant number of natural objects enter into associated behaviour. Only a small number of natural resources have been transformed into instrumentalities of social action. We start not so much with superior "native" capacities as with superior social stimuli for evocation and direction of our capacities.

Speaking in general terms, the social mode of the human existence has produced a situation in which, historically, human progress came to be determined by social rather than by biological principles of regulation. The experience of the human being as a species is no longer defined through the mechanisms of heredity and has come to be structured in specifically social ways: in the production of material and spiritual culture. The development of the psychological functions of the individual is no longer the result of an unfolding of the experience of his species generated internally through heredity, but of an assimilation of external social experience that is embodied in technological tools and in such objects as books and in language.

A child's mental development differs qualitatively from the ontogenic development of the behaviour of higher animals. This difference is determined primarily by the fact that the main thing in a child's development is the process, which does not exist in animals, of mastering the experience accumulated by mankind in the course of social history. We distinguish experience of two kinds in animals; that accumulated phylogenetically and regulated

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by heredity; and individual experience acquired in the life of each one. Matters are quite different with the human being. Unlike animals the human being has experience of yet another kind, viz., the social, historical experience he has acquired. It does not coincide with either species experience, biologically inherited, or individual experience. What is this experience exclusively characteristic of the human being? Mankind, governed by the action of social laws, has developed very great spiritual capacities throughout history. The thousands of years of social history have done more in this respect than millions of years of biological evolution. These advances of psychological and cultural development have been gradually accumulated and being transmitted socially from generation to generation. Because of the social nature of the human psychological functions they are transformed from generation to generation not through biological heredity, but through teaching, learning and sharing in life activities. Mankind has created not only the tools [instruments] which gave the human being mastery over nature; but also has created spiritual or cultural tools such as signs, symbols for directing social behaviour. One of the key tools invented by mankind is language - spoken and written - which plays a leading role in transmitting the social experience from one individual to another and from one generation to the next throughout the entire history of the humankind.

The human being never stands alone before the objective world surrounding him; his connections with the world are always mediated with other human beings and with tools - material - [and psychological such as language and other signs and symbols which render social intercourse possible]. It is by virtue of social

intercourse through the medium of language that the human being possesses human knowledge and skills that have accumulated through many centuries of practical and theoretical human experience. The reflection of the surrounding world in his brain thus becomes, in comparison with his own narrow direct personal experience, immeasurably fuller. It is only in the case of a human being that learning is converted into a special process whereby historically accumulated social experience is transmitted from individual to individual and from one generation to the next.

A newly born animal reproduces in its biological nature changes accumulated in the whole history of the species. Specific features of the species, first of all morphological ones, that is peculiarities of the structure of the animal's body, are realized in every individual. The progressive development, evolution in the world of animals consists of improvement in the biological adaptations of the animals belonging to a given species; to the conditions of the life of this species. Evolution of the species of "homo sapiens", on the other hand, has proceeded in some other different sphere than the biological, the species characteristics being accumulated not in the form of morphological changes, but in some other form. It has been a sphere of social human life form of the fixation of the achievements of human activity in the social and historical experience of humanity. The experience of the species is now reflected not in changing, let us say, the human hand, but in changing the implement used in this hand; it is reflected in the ways and modes of using this implement which are fixed and generalized in it.

If the "natural" type of interrelation with the surrounding world

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- which is typical of the animal - is governed solely by the individual experience [the species experience being given], the "social" type of interrelations with the surrounding world [which typical of the human being] is governed in the first place by the social experience materialized in the material tool and in the psychological tool, especially language.

The behaviour of an animal, to stress again, however complex, is the result of two factors: inborn tendencies [instincts], on the one hand, and direct, individual activity, on the other. In contrast to this, the conditions in which the human behaviour is formed include yet a third factor, beginning to play a decisive role in the development of human mental functions: the assimilation of the social experience of mankind in general, which incorporated in objective activity, in language, in the products of humanity down the ages, and in the forms of social life of human beings. This social factor distinguishes qualitatively the human behaviour from that of animals. The zoopsychological literature is full of observations of how blind, useless and often harmful for an animal, instinctive behavioural acts become when the animal gets into unaccustomed circumstances, when its instincts have been developed in another atmosphere and are not adapted to new conditions. The animal is subject to the call of its biological heredity and responds to it, even when it is in conditions in which the response to the call spells death. Instinct is of limited good, because it is invariable [almost so] and automatic.

Human mental activity takes place in conditions of actual communication with the environment, in the course of which the child acquires from adults the experience of many generations.

The transition from the animal world to the stage of man signifies the introduction of a new principle of development. At the animal stage the development of the brain's functions in each species is the outcome of individual experience but with the transition to man the basic form of the functions of the brain becomes acquisition of the social experience of other people through joint practice and speech.

Language, which incorporates the experience of generations, more broadly speaking, of mankind, is included in the process of the child's mental development from the first months of his life. By naming objects, and so defining their connections and relations, the adult creates new forms of reflection of reality in the child, incomparably deeper and more complex than those which he could have formed through individual experience. This whole process of transmission of knowledge and the formation of concepts, which is the basic way the adult influences the child, constitutes the central process of the child's intellectual development. This means that the word has a basic function not only because it indicates a corresponding object in the external world, but also because it abstracts, isolates, the necessary signals, generalizes perceived signals and relates them to certain categories; it is this systemization of direct experience that makes the role of the word in the formation of mental processes so exceptionally important.

Neuropsychology considers the higher forms of human mental activity as socio-historical in origin. In contrast to the animals, let us emphasize again, man is born and lives in a world of objects created by the work of society and in the world of people with

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whom he forms social relationships. This means that the human being does live entirely in a world of ready-made objects produced by mankind. From the beginning of his life he must always be in contact with other people and, in so doing, he must objectively master the existing language system and, with its aid, profits from the experience of other generations. This contact becomes the decisive factor in his future mental development, the decisive condition for the formation of his higher mental functions distinguishing man from animals. On the other hand, the complex functional systems of conjointly working cortical zones [which are their neurophysiological basis] are not found ready-made in the child at birth [as in the case of respiratory and other systems] and do not mature independently, but are formed in the process of social contacts and objective activity by the child, gradually acquires the character of the complex inner structure. This means that the relationships between the individual components of the higher mental functions do not remain the same during successive stages of development.

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Human mental processes are to be understood as complex functional systems, having a socio-historical origin and exhibiting in their structure different levels of organization. These processes take place as a result of the combined activity of several cortical zones, each of which plays its own specific role in these functional systems and supplies an essential factor [link] for the normal working of the functional system as a whole. This approach differs radically from the symplified psychomorphological concepts of those neuropsychologists who have sought to define circumscribed "centres" in which complex mental functions are



"localized" or who have postulated that the brain, the organ of the mind, works as a single, undifferentiated entity. In other words, higher psychological functions are, in essence, complex functional systems, based on the combined working of individual and sometimes far remote parts of the brain, each of which performs its own specific role and makes its own specific contribution to the integral functional system.

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The human world is full of signs; we live in a world of signs and our actions are determined not by objects per se but by the signs which have been attached to them. Signs, being in principle instruments, are directed not toward external objects but toward human beings; the sign is a means of restructuring the psychological functions of the human brain and influencing the psychological processes of other human beings. Neuropsychologists sometimes make use of the example offered by the medieval scholastic philosopher Buridan. His famous ass finds himself in front of two heaps of hay and, unable to make up its "mind" which one to eat, dies of hunger. Human's behaviour is organized differently. Wherein lies the difference? The difference is that the human being introduces a sign into the situation described by the "stimulus-reaction" formula. He takes a coin, for instance, and says if it comes up head I go to the left and if it comes up tails I go to the right; and in this way resolves the dilemma the ass cannot solve. The human being introduces an object, invests it with meaning, and then acts in accordance with that meaning. In other words, a person finds himself in the situation of Buridan's ass resorts to the aid of auxiliary motives or stimuli artificially introduced into the situation. In place of

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Buridan's ass man would throw lots and thus master the situation. The presence of created stimuli [signs] in addition to given stimuli is a distinguishing feature of human psychology. This means that signs [symbols] are psychological tools or instruments which have meaning worked out throughout the history of culture. The psychological tools that are available at a particular stage in history reflect the cultural level of society. This is organically interconnected with the process of human evolution in the two aspects: the biological and the cultural. In the light of this one can say that the psychological processes of a modern cultured adult is the result of two different processes: the process of biological evolution of the animal species which gave rise to species of homo sapiens, and the process of historical development which has transformed primitive man into cultured man. Both these processes of biological and historical development of human mental processes are represented in the physiogenesis separately as individual and independent lines of development.

The mental level of a modern cultured adult, as previously stated, is the result of two different processes of development: the process of biological evolution of the animal species of homo sapiens, on the one hand, and the process of historical [social] development which has transformed primitive man into a cultured human being. This indicates a radical and fundamental difference between the historical development of mankind and the biological evolution of the animal species. It also indicates that primitive man does not display any essential differences in the biological type or structure, differences which may account for the enormous difference in cultural level between primitive man and modern human being. However, the higher cortical functions [verbal

thinking, logical memory, formation of concept, voluntary attention, imagination, etc.] have suffered deep and all round changes throughout the historical progress of mankind.

If we turn to the history of the development of the brain, we shall see that, as the higher centres developed in the normal members of homo sapiens, the lower, older centers, shared with the higher types of the animal kingdom, did not just move aside, but continue to work subordinate instances under the direction of the higher centres so that in an intact central nervous system they cannot usually be set apart.

Another regularity in the development of the human brain is what may be called a "passing of the cortical functions upward". The subordinate centres do not fully retain the initial type of functioning they had in the history of development, but transfer an essential part of their former functions upward, to the new [uniquely human] centres being constructed over them. Only when the higher centres are damaged or functionally weakened do subordinate centres, in the human brain, become independent and show elements of their ancient type of functioning which they have retained.

Thus, we see that as the higher centres in the human brain develop, the lower centres persist as sub-ordinate centres and that the brain develops according to the laws of stratification and addition of new storeys over the old ones. An old stage does not die away when a new one arises, but is eliminated by the new one, passing into the new one and existing in it. This means that the structure of the human brain in some respect resembles the

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geological structure of the earth's crust.

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The systems approach is one of main philosophical and methodological trends in modern science that was born of the need to find a way out of the crisis in scientific knowledge at the turn of the 20th century. Apart from the systems approach, other prominent trends are functionalism and structuralism. Although in scholarly tradition these three trends are mostly considered in isolation, they have much in common in their sources. In Functionalism and structuralism the principle of wholeness is implemented in the dominant concepts of function and structure respectively. In the system approach the central is naturally the broader concept of system, which is closely connected with other notions: "structure", "function", "organization", "connection", "relation", "element", "control", etc. Its conceptual basis being much broader, the systems approach has many advantages over functionalism and structuralism, as it gives a more detailed picture of the object's integrity and methods of its study.

The conception of Ludwing von Bertalanffy's [1901 - 1972], the outstanding Austrian biologist "general systems theory" was advanced more than forty years ago. Today it has a quite eventful and instructive history of its credit, and most of its principles, both general methodological and special, have lost none of their importance. The organismic concept, which Bertalanffy worked out, is based on the idea that the organism is not a conglomeration of separate elements, but a certain system, possessing organization and wholeness. The basic ideas of the "general systems theory" were first presented to the public in 1937 in a series of lectures

delivered by Bertalanffy at the University of Chicago.

Historically, the first scientific organization which set as its special goal research into the problem of systems theory was the Society for General Systems Research [its original name was the Society for the Advancement of General Systems Theory], founded in 1954 at a yearly meeting of the American Association for the Advancement of Science. Among its founding members was Bertalanffy. In 1960 another research organization concerned with the development of systems theory was founded also in the United States - the Systems Research Centre: the Centre was founded at the Case Institute of Technology [now the Case Western Reserve University].

If one considers contemporary science in its totality, it is hard to find a word that is used more frequently than the term "system". Biologists, physicists, cosmologists, sociologists, linguists, cyberneticists, neuropsychologists, economists, and ecologists, argue about systems, investigate systems of various kinds, discuss systems at many conferences and symposia specially convened for the purpose. This is even more true of modern technology. In other words, broader scientific trends have emerged along with such disciplines as biophysics, geochemistry, physical chemistry, bio-geo-chemistry, bio-geo-cenology, psycholinguistics, engineering psychology, etc.

An example of the systems approach being applied can be drawn from modern biology, and in particular a branch of it called ecology, which studies the structure and functioning of living nature as a whole. One of the tasks of this discipline is the search

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for methods of rational control of natural resources by human society. Up to the middle of twentieth century, in those times when the effect of man's activity upon nature was not very significant the problem was not very urgent. Now its solution may directly determine the whole future of mankind. At the same time problems have arisen which cannot be solved within the framework of our traditional concepts of the living nature as a kingdom of biological species or individuals. How long can we go on polluting water reservoirs and the atmosphere with industrial wastes? How long can conditions for keeping up good catches of food-fishes be created and maintained? What methods of pest control and combating beasts of prey should be used so as not to disturb normal living conditions of useful plants and animals? To find right answers to those questions one has to go beyond the limits of biology and consider the whole complex conditions which determine the relationships between organisms and their environment. And that calls for the introduction of a number of new concepts and, moreover, for a sweeping change in our view on nature as a whole: nature appears before scientists as a complex system which can be fully understood only through an analysis of numerous dynamic interconnections between its various subdivisions. It is this emphasis on various types of connections that determine the specificity of ecology as a system science.

Modern economists are prompted by other practical considerations in their advancement to the systems ideas. For quite a long time they tried to find optimum economic management methods by investigating economic processes only. But it became apparent that for the purposes of this kind of analysis and for an ideal economic system is that dispensing with

people, since humans with their inconsistencies of desire and interest cause disturbances in the steady flow of economic development. The task was then set in different terms: how could one find an optimum combination of centralization of the economic system as a whole and autonomy and initiative of its various branches? This formation has switched the task on to the rails of the systems approach, because the problem clearly cannot be solved by pure economic methods. Indeed, economic analysis nowadays has to take account of sociological, psychological, and even ethical factors. In other words, economists have faced the need to analyze the extremely complex concept of management as regard to social processes, and to formalize the content of this concept. Problems similar in principle face systems specialists looking for the solution of concrete management problems.

In psychology the fundamental inadequacy of Behaviourism gave rise to psychological concepts based on essentially different principles of the study of the psychological functions. The earlier form of such concepts was Gestalt psychology. Its founders Wolfgang Kohler [1887 - 1967], Max Wertheimer [1880 - 1943], and Kurt Koffka [1886 - 1941] showed the role of the structural whole, so called gestalt in the psychological processes. Their thesis, the conception of wholeness [integrative approach] precedes according to the principle of the irreducibility of the complex to the simple, or of the whole to its parts; the integral object is believed to possess properties and qualities not to be found in its constituent parts, whose nature transcends the limits of the rational. Using a wealth of experimental data to substantiate their theories, gestalt psychologists have made the first step towards discovery and study of the wholeness of the psychological

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processes. Their concepts were not entirely free from defects which have been subjected to meticulous and thorough neuropsychological criticism. The most serious faults of gestalt psychology concerned an a priori interpretation by it of the psychic structures; this interpretation nullified the problem of the formation of the psyche and was thus incompatible with many empirical observations. This school's solution of the psychophysical problems in the spirit of psychophysical parallelism also proved faulty.

It is important to note here that the neuropsychological approach to the human psychological process, previously detailed, is a "systems approach". The deep philosophical and methodological kinship between theoretical neuropsychology and the systems approach is an indisputable fact which can serve as sufficient grounds for their coming close together. This conclusion follows both from the general character of the development of neuropsychology and from the specific methodological problems arising in this development. Neuropsychologists discuss the preconditions of psychological research; bearing on and understanding of the profound specificity of the psychological phenomena. The hierarchy of the universe include three global levels; The non-organic, the organic and the symbolic, that is, human. It is precisely the creation and the use of symbols that distinguish the human world qualitatively and of exclusively that of animals.

Symbols form the superstructure of the human culture and history. Human behaviour, cannot, therefore, be explained adequately from the standpoint of zoomorphism, in the terms of



the behaviour of rats, doves, dogs or monkeys. This approach has direct practical applications: in psychotherapy, for example, it assumes that the causes for disorders must be looked for at different levels, including the sphere of values and symbols. This group of preconditions also includes the need to bear in mind in neuropsychological research that the human being is not an isolated island but a part of systems of various levels, beginning with groups of and ending with civilization.

### *Chapter Three*

## **The Brain and Psychological Functions**

- 1 -

When we speak of the psychological and the physiological, we are speaking of two different things.

"I feel" means "I record", I reflect some external object, but the sensation itself is not the imprint of a seal on wax, not what happens in the neurons of the brain of the sense organs under pressure from the object. Sensation is a need multiplied by the action of the whole organism, which actively seeks an external object and records that object in the seeking movement. Even the subtle investigators of the physiological substratum and its "mechanics" will never be able to explain the mysteries of the simplest psychological act because the physiological processes are not equivalent to even an elementary sensation or perception. The physiologist has studied the mechanism of the psychological functions taking place in the cerebral hemispheres of the human brain. He has explained how perception, for instance, takes place physiologically, but his explanation does not cover the psychological phenomenon itself. The psychologist, on the other hand, speaks of perception in quite a different key. For the

psychologist perception takes place not "inside", not in the nervous apparatus but, strange though it may seem, "outside" it. Psychologically or mentally, perception is always, as it were, taken out of the confines of the physiological organ [the brain or the organism]; it is always an idea or image presenting itself to the brain. The mental or the psychological is in essence a reflection of the external world lying before the human brain; in the image he sees, and in his emotional judgements and understanding of the impressions or images. Naturally, the psychologist does not identify the "outside" image with the objective thing that is actually outside the human brain. That is why we speak of the psychological when we evaluate the objective world that presents itself to us as a world we have perceived. Before us, for instance, we have an object [let us say, lighted candle] and to the brain with its plenipotentiary - the eye. What we have to find out is the location of that internal image of the candle that appeared when the retina of the eye was affected by the light rays reflected by the candle and transmitted directly to the eye by its flame. Why is it so important to locate this subjective image? Because the whole psychological world [the human mind: the contents of the brain] is composed of such images. They are meshes of the network of the psychological phenomena.

The ordinary notion of the process of mental reflection as a passive, contemplative act suggests something resembling the exposure of a photographic plate by the movement of a camera shutter. In strict accordance with the laws of optics the light rays reflected by the surface of the candle and radiating from the flame focus on the optical centre of the eye and project an inverted image [candle flame downwards] onto the retina of the eye. Then

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somewhere in the brain the image is again inverted and this is what we see, this is the image of the lighted candle. Where it is located and by what laws its original position is restored - all such questions will one day be answered by neurophysiology. For the time being we simply have to believe that the image arises somewhere in the brain. As for the restoration of the object's normal position, it has been suggested by specialists that no "second" inversion takes place at all. This is done by the brain itself.

There is a great deal that we do not understand in the simple everyday sensation and perception. From the point of view I have just expounded it is not a photograph developed on nerve tissue, it is the material trace of the effect of external objects. But one might expect, the more closely the process of perception was studied, the less hope remained of eventually discovering somewhere in the nervous system the imprint of the lighted candle. The first thing that emerged was that the eye cannot be compared to an optical instrument. As the physiologists sometimes say, it is a "bit of outboard cortex" the light - sensitive nerve formation of the outer layer of the retina instantly transforms the streams of light into purely physiological processes, into excitation of neurons without giving them any opportunity to "imprint themselves" anywhere in the form of a picture. In other words, electromagnetic waves are turned into nerve impulses. The eye is more like a television which turns the light streams from the object into the complex functioning of the radio-electronic apparatus of the receiver. And just as there is not a hint of the picture in the complex processes in the television set, there is nothing of this kind in the head either. Admittedly the TV receiver is able to reproduce in its electro-ray tube changes in the distribution of

bright or luminescent layer which, when our vision is adjusted accordingly, we perceive as a repetition of the essential attributes of the distant object from which the light was reflected. Has the brain any such capability? The excitation caused in the photosensitive formation of other layers of the retina is transmitted to the central nerve cells. Simultaneously, other sections of the retina receive impulses that come from the visual centers of the cortex, regulating by feedback process the excitability of the various parts of the retina. We are thus confronted with the peculiar life of the nervous system, a mosaic of excitation and inhibition, irradiation, concentration, the mutual induction of the nervous processes. Mysterious biochemical changes take place in the nervous system and not one of them or all of them together reproduce the image of the lighted candle in the head of the visual receptor.

From the standpoint of neurophysiology, cognition [sensation, perception] is not a passive reflection of the effects of external objects, it is necessary to stress that the visual image of the object, and the object itself, differ fundamentally from each other. When we look at an object, we see the object. Of course, we do not see everything in the object and perhaps we do not see it as it is in reality. What I see in the object, and the object itself, are not one and the same thing. The main obstacle to the neurophysiological understanding of the cerebral mechanisms of visual perception was the "receptor" theory of sensation and perception that held almost undivided sway over psychology and neurology in the nineteenth and beginning of the twentieth centuries. According to this theory sensation is a passive process caused by stimulation of the sense organs by external agents. The responses from the

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retina pass to the receptor centres of the cerebral cortex where they become sensations; only later are these sensations united in perceptions, which in their turn are converted into more complex units of cognitive activity. The neurophysiological theory treats sensations and perceptions as active processes distinguished by a certain degree of selectivity and including efferent motor elements. In perceiving the objects of the surrounding world the eye actively "gropes" for them and these "groping" movements along with the signals from the eye motor muscles are elements of visual perception. So the investigation of the visual perception under laboratory conditions shows that it has a complex structure, similar in principle to the tactile perception, where the groping hand identifies as a succession of attributes that only gradually unite into one contemporaneous whole.

Consequently, the mind is certainly not what happens physiologically inside me under the influence of the external stimuli, or without them as such. Without them, that is, without correlation at every instance of my life-activity with the objectively existing world, my psychological processes or "inner world" cannot exist. That which happens inside me but has no objective representation outside my brain is not the mind. It is physiology, biochemistry, anything you like, but not my psychological processes [my inner mental world]! My "mental world" is above all the impressions of the world of culture in which I live and act; it is the real existence of nature assimilated by man, every detail of which signifies for me that which it objectively represents; in other words, my mental world is, in fact, the being, the existence of which I am aware.

Thought is not produced by the human brain, any more than it is produced by the cultural environment, especially language, as a means of speech communication. Only intercourse between individuals as a social process is at one and the same time the actuality of the process of thought, its genesis and its realization. Clearly, then, one cannot discover the nature of any human mental ability by exclusively studying the neurophysiological processes occurring in the human brain. The only thing that can reveal to us the nature of the human psychological function is the social intercourse between the human brain and the social surrounding world, on the other hand in order to enter into intercourse, with living and past generation, every human being must possess a brain organised in a certain way. He must be born a human being in the structure of his organism. From this standpoint the attempts to discover the specific nature of the human psychological world by analyzing only the neurophysiological peculiarities of his sense organs and the brain are no more than relics of the anthropological interpretation of the human nature. And this being so, it is quite logical first and foremost to acknowledge the community of the natural, sensuous means of mental reflection in man and animals and then introduce a highly important addition language as a social phenomenon. No one contests the fact that man inherited the means of sensuous perception from his animal ancestors. But the animal's individual behaviour, its selective attitude to the objects of the external world are somehow predetermined by the sum total of biological needs peculiar to its species. The animal sees in the world around it only that which it needs to see, its perception is prepared by the biological evolution of the species, and these, as it were, expected by the organism. If an animal has no instinctive attitude to a given thing and the given thing is not

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related to the realization of this attitude, then the thing itself virtually does not exist for the animal: has no direct biological significance for it. On the other hand, here is the case in point on documentary fact, that a normal child with all the means of perception we have in common with animals was lost and for a time lived with a pack of wild animals; he lost the ability to perceive things that any normal human being would notice immediately and stopped mentally developing as a human being. The mentality of the social human being differs from that of an animal not because of any immanent, innate "addition" but thanks to that which in general distinguishes the human being being's inner world from that of animals another.

Man inherits part of the "species programme" of life activity, but the greater part [and precisely the specifically human part] is geared into the "mechanisms" of his life by his mastering the objectified means of culture in intercourse with other people. He even develops his bodily needs and abilities in the process of mastering the historical ways and means of activity and intercourse, such as the need for social communication, for prepared food, for "instruments", to consume it with, for objects that provide for the human functioning of his organs, creating the conditions for normal sleep, rest, labour, and so on.

The possibilities of human cultural growth are endless. This growth is not imprinted in the genes. It is quite obvious that if the children of contemporary parents were deprived from birth of the conditions of contemporary culture, they would remain at the level of our most remote ancestors who lived tens of thousands of years ago. Whereas the children of such "primitive" people placed in the



conditions of contemporary culture they would rise to the heights of contemporary man.

Summing up: each concrete individual embodies in sublimatest form the historical experience of a number of generations and in this sense is the product of many ages. Through his life the individual is exposed to the influence of a wide variety of social phenomena. All of these taken together constitutes his social environment in the widest sense of the word. The immediate conditions for the existence of the individual which can be singled out from the social environment as a whole constitute the individual's microenvironment. Therefore, our attention must be directed not only at the overall socio-historical conditions as the basic factor determining the formation of the individual, but also at individualized conditions, those of the microenvironment.

- 2 -

The human body is asymmetrical. The right arm is usually more massive and larger than the left, as well as being more dexterous. The right side of the chest is longer than the left. Each one of us has a better leg. The brain is also asymmetrical. Its right hemisphere is slightly bigger than its left in terms of mass [by some five grams] and it has more convolutions [two of these as compared to one]. The left hemisphere is responsible for the right side of the body. It contains more grey matter and its alpha rhythms [the basic rhythms electroencephalogram] occur with greater frequency and smaller amplitude. However, it is in its functioning that the brain's asymmetry is most clearly manifested.

Anatomically, the two hemispheres are linked together and

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normally function as one organ. They are united not only by the common stem that descends from the brain to the spinal cord but also by a number of the cross bridges between them. The two [cerebral] hemispheres differ greatly in their functions. The left one plays a dominant role in speech. The right one has also specialized functions, but until recently we have had less information about these functions. It turns out that the right hemisphere plays a dominant role in the process of the perception of the environment.

Thus, there are different functions of the two hemispheres of the human brain. The left hemisphere was already known to engage in sequential logical processing and to be the seat of language. The right hemisphere is the organ of perceptual [pictorial] thinking. Recent neurophysiological research discovered that the right hemisphere could not "speak" but did "understand" what was said to it; it was not less "intelligent" but it performed a different form of thoughts: simultaneous and perceptual thinking. In processing information the left hemisphere analyzes objects inductively, the right deductively. The left one processes data sequentially, the right hemisphere processes data simultaneously.

Neurophysiologists have recently developed methods that make it possible to "shut" alternately the hemispheres and thereby determine what each half of the brain does. By "splitting" the human brain, neurophysiologists have discovered two entirely different, even polar, types of thinking in one head: they are addressed to different times. The right hemisphere, retaining accumulated experiences, deals with the present and the past, the

left hemisphere, ensuring abstract cognition, links the present to the future. This means that in the development of the brain one cannot help seeing one of the most striking aspects of organic evolution. Indeed, the extent of space-time continuum in which the universe develops inevitably as a past, present and future. The evolution of the human brain leads to a state of affairs where, at any given moment, the brain inevitably had to combine within itself these three parameters of time, and this is what determined its power over the environment and its ability not only to reflect and discover the laws of the world, but also to transform the world. In fact, every time one portrays the world, this presupposes his anticipation of reality, which is organically linked with reflection, and therefore also the possibility of him changing it. For this very reason, anticipatory reflection [which is tested by practice and by the coordination of past, present and future] allows man to catch the conditional and the relative in the unconditional and the absolute, and vice versa.

From early childhood and then throughout his life, man acquires the ability in the form of images, to imagine and hence to analyze his own relations with the surrounding world. In outstripping the present, these ideas are orientated towards the future and combined with ideas which he has about the possible actions and experiences of other people.

It has also been established, neurophysiologically, that, depending on which hemisphere is at work and which is made inoperable, the individual displays abrupt changes of mood; "shutting off" left hemisphere gives rise to a state of deep depression; "shutting off" the right one causes a reverse state: the

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individual jokes, laughs and bubbles with optimism; he becomes talkative even to the point of garrulity but, oddly enough, his speech is colourless and devoid of real human intonation. He cannot distinguish between the male and a female voice and cannot really tell the differences between the noises made by an engine, thunder or waves breaking on the shore. A lacking right hemisphere individual has great difficulty understanding speech. but he can identify figures and drawing well. A left hemispheric person is a typical theoretician. In contrast, a right hemispheric person is attracted towards practical forms of activity.

If spoken words are presented to the right ear or written words are briefly flashed in the right visual field presentation, the typical right handed person is more accurate or rapid in identifying the stimulus as to the left-visual-field presentation, and vice versa: [in case of non-verbal information such as shapes or musical chords].

The left hemisphere is more specialized in sequential processing which is analytical as well, whereas the right hemisphere is more specialized in the parallel processing which is holistic and simultaneous. Functions which are most often under primarily the right hemisphere control include visual-spatial-reasoning, facial and visual recognition of forms, musical ability, and copying and drawing geometric figures. Left hemisphere processing involves analysis of information in a logical sequential manner, while right hemisphere processing involves more synthesis of information in a simultaneous manner.

One of the most important aspects of the human cortical functions is organically connected with hemispheric-dominance

for speech - language. Until recently it was thought that a right handed person was necessarily left-hemispheric-dominant, and similarly a left handed person was right-hemispheric-dominant for language. now it is known that is not so and that the whole question of the relation between handedness and cerebral dominance is highly complex and variable.

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The problem of brain asymmetry invites deep theoretical reflection, why should there be more right handed people than left handed? There are also ambidexterous individuals, who use both hands with equal ease. Among Europeans the left handed account for 3% - 10% while in some areas of Africa their proportion reaches up to 50%. It would appear that is the low percentage of left handed individuals in Europe that has given rise to the belief that left handedness is somehow a deviation. Many neurologists have called our civilization "left-hemispheric" attributing a negative connotation to the epithet. They believe that we ignore the needs of the right half of the brain, and thereby exploit only half its potential. The present system of education, in the main, "favours" the left hemisphere. The study of the functions of the two hemispheres will help mankind to fully utilize the boundless potential of the human brain which is a whole galaxy enclosed in the cranium with billions upon billions of nerve cells [neurons]. The human brain is full of unrealized [unactualized] opportunities at any given moment; the actualized cortical functions are insignificant part of the brain potential. Even man of genius does not utilize all of his brain potential.

The most obvious asymmetry related to the human brain is

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handedness, which is often related to the lateralization of other cortical functions [lateralization refers to functional asymmetry of the two cerebral hemispheres: that is, though the two halves of the brain work as coordinated whole, many functions are subserved by one hemisphere than by the other]. In right handedness, it is almost always true that speech functions are found primarily in the left cerebral hemisphere. While this is also true in the majority of left-handers to have speech functions either primarily in the right hemisphere or distributed between both hemispheres. Left-handers are likewise to have less functional asymmetry than right-handers.

A right-handed child can be trained to write with the right hand, and right handed subjects who have lost right hands by amputation or accidents can learn to write successfully with the left. Some neurophysiologists have suggested that writing with the right hand by a left-handed person may shift speech dominance to the left hemisphere, but there is not firm neurological criterion that show that this line of action has taken place.

Many people have experienced the difficulty of the pain of getting left-handers to use their right hands. It often provokes chronic stress, which has a harmful effect on the child's health. The excessive efforts of parents to forcibly make the child forget about using his left hand in an intensive motion, especially if these attempts are accompanied by tactless remarks or even by punishment, can result in mental disturbances. It should be realized that a left-handed youngster taught to use his right hand cannot be made into a right-hander. only his motor behaviour can be changed to a certain extent. All the other distinctions of his

psychological make-up will remain as they always were. The exponents of getting left-handed children to use their right hands usually base their case on the fact that our right-handed world is not especially well adapted for the leftists. Traditions dictate that predominant use of the right hand, and this explains the school equipment, manual tools, implements and machines. For this reason the left-handed youngster will have to expend additional efforts, which can lead to excessive nervous and physical exhaustion. It is true that these considerations do have some logic to them. But is it not equally reasonable to try and make the left-handers' environment more congenial rather than attempt to change their natural attributes? It is within our power to create conditions that enable left-handers to enjoy a comfortable life in our "right-handed" world.

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It is highly significant to note here that the Neurosciences Research Programme of Massachusetts Institute of Technology sponsored a conference during the third week of May 1977 on the thesis: "Sex and Brain". The findings of the experts prove the principle of brain asymmetry in normal people. The experts have encountered sex differences in the structure and functions of the brain. In right-hemisphere-tasks males tend to have a greater left-visual-field superiority for dot location and dot numeration than females. Experts also knew that males are superior to females in certain visual-spatial-tasks. It may be that right hemisphere specialization is more dominant in males than in females, whereas it is the contrary in females [and many cases such specialization may be more advantageous]. This means that there are considerable differences between the structure and functions

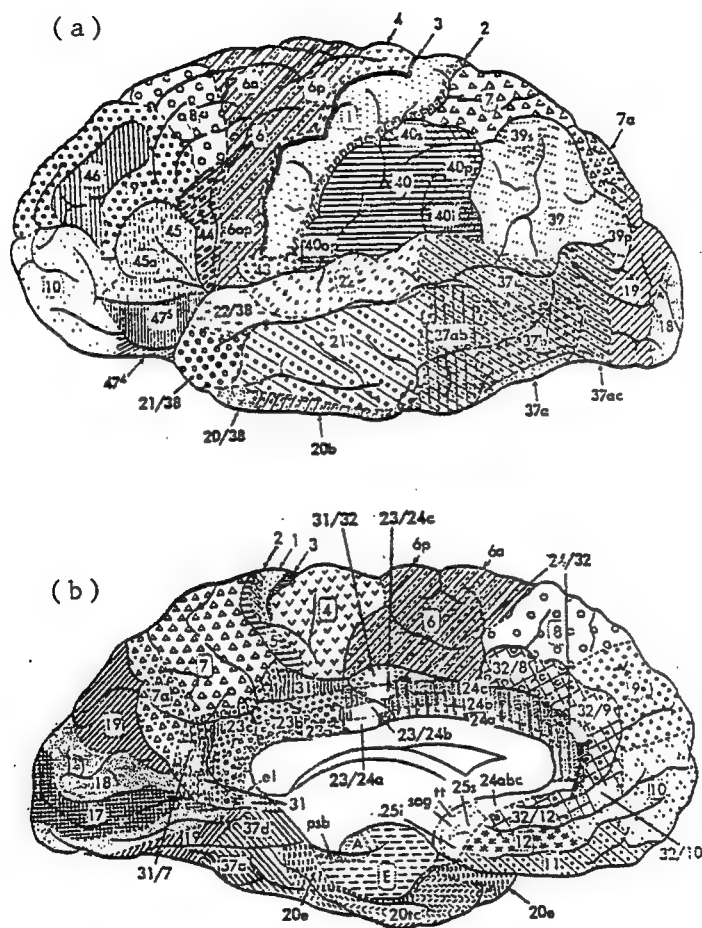
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of the brain of males and that of females. The left cerebral hemisphere [responsible for abstract thinking] is dominant in the brain of males, whereas the right part of the cerebral hemisphere [responsible for perceptual thinking] is dominant in the brain of females.

Statistical surveys have shown that almost one-third of mankind has no distinct hemispheric specialization and that asymmetry is usually more expressed among men than among women. As the years pass [especially with the onset of old age] brain asymmetry decreases. However, what has been established is that each individual has a distinct hemispheric structure which, like fingerprints, distinguishes him from the millions of other people.

Neurophysiologists have recently established that a child is born with identical hemispheres, both of them are "right". At any time before the age of two either of them can turn "left", becoming a speech hemisphere. Another relevant neurological fact is that brain asymmetry develops much faster in boys than in girls. By the age of six the male brain has developed a distinct specialization. In contrast, the halves of the female brain do not develop distinct functions until the age of thirteen. However, the female's brain is less functionally asymmetric than male's.





Scheme of the cytoarchitectonic fields of the cerebral cortex (a) convex surface of the cortex (b) Medial surface of the cortex, (Based on the records of the Moscow Brain institute.)



## *Chapter Four*

# **Educational Implications**

- 1 -

A child has come into the world. There is now a new living creature in our midst endowed with all that is necessary to become a human being in the full sense of the word. A brain with millions of nerve cells, muscles capable of executing the subtlest or the most powerful movements, speech organs enabling him to produce the most diverse human sounds, and much else besides. Yet turning into a full normal human being is a task that is only just beginning. It is something a child can only achieve if the people around him help him to do so; if they accept him into their society, share their knowledge and experience with him and teach him to see, listen, feel, and think in a human way. All these higher mental and emotional functions are not something the child is born with; it is during the course of his life and only with the help of older people that a child gradually acquires the skills of selective attention, conscious memory and logical thinking. On the other hand if for some reason the social links between the child and the people around him are disrupted, his normal development is held back and sometimes even brought to a stand-still.

No child is endowed with psychological functions ready-made

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at birth; he builds them up in the course of his life and comes to master for himself the knowledge and the skills which people before him had possessed. In the course of this social process he is bound to enrich the treasure-house of human experience and later hand over to a new generation his own contribution, his baton in the relay-race. This is why, when a child is wrested from a normal set of social relationships with other people, he does not turn into a full human being but into something a little more than an animal.

The joy, hope and future of most families is tied up with children. It is a great happiness to every mother to know that her child is healthy, happy and candid, eats well, sleeps soundly and develops normally both physically and mentally. Children are the most important thing in the life of a woman, but in the life of society at large; they represent the future and there can be no future without the present. All our personal and social achievements would be futile if we did not know that we shall eventually be replaced by the new human beings, by new talents that will take the best we have achieved in our day and will pass it down to their children and grandchildren, to new generations, to those who are destined to make life a most wonderful thing.

- 2 -

The most important problems of the mental development are the questions of the historical development of mankind down the ages [phylogenesis] and of the individual development of the child from birth to maturity [ontogenesis]. Two conceptions are diametrically opposed in connection with these questions: the traditional and the neuropsychological. The former conception

views mental development as a pure psychological process of the unfolding of inborn intellectual abilities inherent in the human organism; the living conditions of the human being form only a background to this process. Neuropsychology, on the other hand, rejects the notion of the psychological heredity.

Neuropsychology rejects the assumption of directly inborn mental abilities. Only certain anatomical and physiological characteristics of the human brain, which are the material basis of these abilities, are inborn. Mental abilities are always the product of the interaction of the human organism and definite social conditions. Neuropsychology also rejects the quantitative measurement of mental abilities because it is founded on a fatalistic theory of innate intelligence and aptitudes.

The child enters society with his very first steps into the social and psychological life; he learns from society the activities which it has developed and the language which reflects the social practice of mankind. His social environment presents him with all kinds of tasks and demands and this actively makes him engaged in activities required by these tasks and demands. This means that the development of the mental processes of the child, e.g., of thinking, perception, memory, imagination takes place under the influence of all kinds of conditions of his social milieu.

Our educational task consists in directing the child's mental development in such a way that what he has achieved in a previous stage is continued according to plan so as to develop in the child qualities that would be of decisive importance in the next stage. In other words, it is necessary to orient not only the existing

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possibilities of the child but also the perspective of his further development. The transition to a new sphere of life relationships, to new "position" in life, must not occur spontaneously but must be directed by education.

The growing interaction of the child and the world around him produces, by bringing out even new psychological characteristics, a change in the manifestation of his physiological foundations. Through this interaction, the child's organism develops; His central nervous system matures, and especially the organ of the development of mental processes - the brain - and his horizon broadens and deepens. It is very important to note here that the psychological processes are formed in the child - through a stage - by - stage process; the transition from one stage or level to the next constitutes the process of transformation of the external material [or materialized] mental action of the child gradually into internal [psychological:mental] action. The initial form of any mental act may be either material or else materialized [the difference between them does not concern their operational aspect; in both cases the operations are carried out by the child manually and are material in form. It concerns primarily the nature of the object to which actions relate. In the case of materialized form, the relevant object of actions are surrogates and models of original object]. In the course of that process the external [material or materialized] objects of action are replaced by their mental images or impressions [sensory or conceptual]. This means that material or materialized form of actions is the initial stage of the process of the formation of any psychological function in the child. At that stage the object of action is performed either in the form of dealing with real objects [the

material form] or else in the form of models, diagrams, sketches, pictures [the materialized form]. In both cases actions are carried out as actions producing real transformations. In the second stage the perceptual form of action manifests itself as a mental act. This means that the mental form of action refers to cases in which actions are carried out within the child's mind and their structural elements are idea. The possibility of carrying out an action entirely in a mental form indicates that the action has completed the full course of internalization and that it has transformed from any external act into a mental one. Thus the mental form of action is the concluding one in the transformation of actions from the external to the internal [psychological or mental] ones.

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Childhood is an important period in the life of a person, not a mere preparation for future life. It is the most vital period of man's life; a real, vivid, unique life all of its own. The kind of man the child of today turns into is determined above all by the kind of childhood he had, the people who guided his early steps through life, and the experience of the world around him which imprinted itself on his mind.

There is nothing richer or more complex in this world than the human being. The period of the development of the human being, physically and mentally, from birth to maturity, is the longest of all the various representatives of the animal kingdom. The human body grows, develops, and becomes stronger for almost twenty years. It is as if this long period were necessary, mainly, for the development, strengthening and education of the central nervous system, especially the cerebral cortex of the human brain. The

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human being, precisely because he or she becomes a person, experiences an extended infancy of the central nervous system, a childhood of the brain. The child is born with many billions of nerve cells, which respond immediately to the surrounding environment, and are able, under certain circumstances, to carry out mental functions. These nerve cells are the material foundation of the human psychological processes. Every child not only perceives but draws, creates, and composes as well. The child's vision of the world is a unique artistic creation. The images simultaneously perceived and created by the child has clear emotional overtones. Children experience stormy joy when they perceive images in the surrounding world and add something to them from their imagination.

Emotional saturation of perception is the internal supplier of children's creativity. It is possible to say, from the standpoint of neuropsychology, that without emotional enthusiasm, the normal development of the brain is not possible. The physiological processes which go on in the child's brain are organically connected with active emotions; in moments of enthusiasm and interest, the amount of food going on to the cells in the cortex of the brain is increased. The cells expend a lot of energy in these periods, but on the other hand, they also get a lot from the body. Observation of the intellectual labour of children in elementary classes over a period of many years, the author is convinced that in periods of great emotional enthusiasm, the thoughts of the child become particularly clear and memorization occurs with more intensity.

The child thinks in images, colours and sounds, but this does



not mean that he has to go no further than the stage of concrete thought. Thought based on images is an essential stage of the transition to thought involving concepts. Children gradually master concepts such as phenomena, cause, consequence, event, dependence, difference, similarity, community, compatibility, incompatibility, possibility, impossibility, and so on. Without concepts, abstract thoughts, the nature of concrete things remain hidden from children's eyes as if by an impenetrable wall. Nature becomes a school of mental activity only when the child is able to abstract himself from the things around him, when he can do his own abstract thinking. Vivid images from the real world are essential to help the child discover the interactions which are one of the principal features of the surrounding world. Concern for the development and strengthening of the child's brain so that this mirror of reflecting the world would always be sensitive and receptive is one of the main duties of the educator. Just as the muscles develop and grow stronger from physical exercise and overcoming difficulties, so are efforts necessary for the formation and development of the brain. The child's brain develops and grows stronger due to a complicated internal processes of awaking the energy of nerve cells, which occurs at a moment determined by multi-faceted connections between the objects and phenomena of the surrounding world - cause and effect, temporal, and functional. When the child thinks through something, searches, tries to get to the essence of something, he or she does not understand, the cells of the cerebral cortex of the brain make efforts which through these microscopic muscles, strength of which becomes reason, into action. It is important to help children understand the connections between phenomena of the surrounding world, and to activate new strength in the efforts of

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those microscopic muscles everytime. This complex phenomenon is the process of formation, strengthening, and development of the most important qualities of the human brain - and sharp-wittedness, and the ability to observe. The work of the human is discrete, occurring at intervals. Stimulation of the stream of information from the surrounding world arises in one group of nerve cells in the cerebral cortex, than in another. Thought instantaneously switches from one object to another, and that switching is an important factor in the process of thinking; the ability quickly to change one's train of thought corresponds to the transforming of thoughts from one group of nerve cells to another. This is the main precondition of adequate mental ability. Effective mental exercises to awakening internal energy of the brain and to stimulate the play of strength in the "intellectual muscles" are found in problems which develop keenness and quickness of wit. These problems are found in things, objects, and phenomena of the surrounding world. Directing the attention of children to this or that phenomenon and trying to get all the secrets they did not yet understand are of paramount educational significance.

Education in the wide sense is a many-faceted process of constant spiritual enrichment and renewal both for those being educated and those who educate. The educative process finds expression in a coming together of the spiritual life of the teacher and the child. Tens and hundreds of threads between the minds and emotions of the teacher and the child are tiny paths which lead to the human sharing of interest and aspirations. If a teacher has once become a child's friend, and if this friendship is enhanced by some absorbing and noble interest, positive, sensible aspirations then a child's heart will remain free of any social evil. And if there

are children in a school who are on their guard, oversensitive to criticism, and mistrustful, and sometimes even malicious children, this is only because teachers did not get to know them properly, did not find a right approach and failed to get through them. Education without friendship between the teacher and the child is a futile exercise. Nothing amazes or absorbs children so much, nothing awakens the desire to learn so forcefully as a clever, intellectually stimulating and generous teacher. In children there are slumber talented mathematicians, physicists, chemists, historians, biologists, etc. These talents will only come to fruition when children find in those who educate them that "life-giving water"; without which those talented will wither and fade. School becomes the centre of children's intellectual and emotional life, if teachers give lessons that are interesting both in form and content. Yet remarkable brilliant lessons are to be found wherever there are other remarkable things apart from lessons, where a host of opportunities are provided for children to develop their various abilities outside lessons and are used to the full.

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There are no more humane professions than those of the doctor and the teacher. A doctor fights for a man's life up to the last moment, never letting the patient feel his condition hopeless or even serious. That is a fundamental principle of medical ethics. Teachers must develop and foster educational ethics, they must uphold the human principle in education as the most important feature of pedagogical training and skill of each teacher. Every thoughtful teacher knows how deeply a child's self-respect is wounded if he comes to learn that others around him have lower opinion of him than he deserves. In the opposite situation, if a

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child realizes and senses that a teacher and other children are aware of and appreciate his particular merits he will go out of his way to become better still. Indeed, the whole secret of the teaching craft lies in keeping alive in children this inclination and moral effort. No educator can implant good in a child's heart if the child himself is not aspiring in that direction. Yet this aspiration is only to be found, when the teacher and other children see first and foremost the good there is in a child. The main social tie between the educator and his charge, should be two sincere desires; the child's desire to grow better and the teacher's desire to see the child better than he already was at a given moment. In order to become a man worth his salt, a child must first and foremost respect himself, for without that respect, without admiration of what is fine within himself there can be no integrity or intolerance of all that debases the child. But in order to bring out self-respect in the child, the teacher himself must entertain deep respect for the personality of his charge.

The art of education involves first and foremost the art of speaking, addressing oneself to the emotions. Emotionality is not a factor which supplements other fundamental "aspects" of teaching, not one of a list of essential factors in a lesson context, but a means towards stimulating interest and the only way in which to stretch a child's mind, to preserve the magic of childhood while teaching children. Through emotions children develop their minds; emotional awakening of mind. It might at first seem that the path from a teacher's knowledge to the child's knowledge would be a straight one. Yet in reality the shortest route proves the longest and the most difficult, if the "conductor" of the emotions is not set in motion. The path that leads from the

teacher's knowledge via his emotions and then those of the child to the child's knowledge proves far shorter.

In the works of the well-known scholar Sigmund Freud [1856 - 1939], the author came across an interesting idea about the interaction of the nerve cells of the cerebral cortex and the subcortical centres of the human brain. Freud assigns a decisive role in thinking to the subcortical centres, which, neuropsychology has shown, rule the emotional processes of the human psychological life. The scholar compares feelings and reason with a horse and rider. In his opinion, the horse determines the route [i.e., feeling - the subcortical centres]. The horse takes the rider where it wants to go, but does it so cleverly that the rider thinks that he is ruling the horse. Thus according to Freud, the main thing is not the cortex of the human brain, but the subcortex.

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There is no inconsistency in saying that in schools there is usually both too much and too little information supplied by others. The accumulation and acquisition of information for purposes of reproduction in recitation and examination is made too much of. "Knowledge", in the sense of information, means the working capital, the indispensable resource, of further inquiry, of finding out, or learning, more things. Frequently it is treated as an end in itself, and then the goal becomes to heap it up and display it when called for. This static, cold-storage ideal of knowledge is inimical to educative development. It is not only less occasions for thinking go unused, but it swamps thinking. No one could construct a house on ground cluttered with miscellaneous junk. Pupils who have stored their "minds" with all kinds of material

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which they have never put to intellectual uses are sure to be hampered when they try to think; and no one can carry around with him a museum of all things, whose properties will assist the conduct of thought. The well-known mathematician Felix Klein [1849 - 1925] compared the secondary school student with a cannon which had been loaded with knowledge for ten years and then after it was fired there was nothing left inside. I remember this grim joke when observing the intellectual labour of the child compelled to memorize something he does not understand. The substitution of rote memory for thought, clear perceptions, and at keen observation of the essence of phenomenon which has been memorized, is a major flaw which stupefies the child and, in the end, kills his desire to study.

To avoid turning the child into a mere depository of knowledge, a treasure-chest of information, one must teach him how to think. The sole direct path to enduring improvement in the methods of instruction and learning consists in centering upon the conditions which exact, promotes, and test thinking.

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Of course, poetry, for instance as well as a role in a play, must be learned word for word, i.e. "by heart", whereas in science and in general education semantic memorization is more important because it is more effective. Verbalism, memorization without comprehension, is actually cramming, while substitution over verbalism account of other people's thought for one's own is quotationism. Semantic or logical memorization is the result of a complex mental process. On the other hand, most of what is verbally memorized is forgotten, whereas material memorized by

its meaning [semantic memorization] is retained much longer, although if, it is not from time to time refreshed in the "semantic memory", it will also sooner or later be forgotten. At times we commit to "memory" a lot of entirely needless trifles which in the end encumber our "memory", if they are not soon forgotten. Forgetting also rescues us from unpleasant memory and, what is even more important, helps us, by disregarding details, to retain the basic, generalized concepts and conclusions. Consequently, the biologically expedient law of forgetting is one of the manifestations of the selectivity of memory. The bad and the unpleasant is forgotten sooner and more completely than the good and the pleasant. On the other hand, one may memorize what he perceives (visual and auditory memory) his movements with his motor memory, his thought with his logical memory, and his feeling with his emotional memory.

In the process of memorization the material must necessarily be systemized. Of special importance here is the ability to find differences and similarities in things. One may even say that the memory is a storehouse of the brain, but has many partitions and it is therefore necessary to store everything in its proper place. Systematism in accumulation of knowledge helps more than anything else to develop readiness of memory. When committing anything to memory we must understand why are we doing it and in what cases we may need the particular information. The most important of all qualities determining the productivity of memory is its readiness, i.e., its ability to extract from the stack of memorized information precisely that which is needed at that moment. There are people who know a lot, but all their knowledge is a dead weight in their memory. Others may know less but their

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stack of information is always ready to hand and the memory always reproduces what is needed; the readiness of memory forms in the process of memorization which must necessarily have certain meaning and during which associations are immediately formed between the material being memorized and the cases when this material may be needed.

Inquisitiveness and curiosity have been inalienable properties of the human nature since time began. Where love of knowledge is lacking no school can thrive. Intellectual indifference, or poverty of intellectual response all blunt the child's receptiveness to wisdom, innovation and the worth and beauty of ideas and knowledge. If no questions are forthcoming after a teacher has addressed the class during a lesson and "everything is clear", this is the first sign that children in class have ceased to experience intellectual needs and that all that remains is a tedious, wearisome obligation to learn the daily lesson. On the other hand, a clever teacher can foster any spark of curiosity, inquisitiveness or love of knowledge he finds in him. The only way to fan that spark into a flame is to ensure that the child discovers the happiness of success in his intellectual work, the pride of accomplishment. A wise teacher rewards each success, each conquest of difficulties with the deserved good mark, but do not over use the latter; he is convinced that the soil on which the edifice of his teaching skills is built in the child himself, in his attitude to knowledge to his teacher. He teaches children to derive joy through diligence; he fosters interest in learning and imparts to them the desire to become worthwhile people. A child should not be allowed to feel that he is inferior to others, incapable or backward, his sense of dignity must not be slighted. All children, even the most backward,



must be trained for the role of worthwhile people; a child must believe in himself, believe that diligent work will enable him to come to grips with his weaknesses, and that a good school progress is within everyone's reach. However, not all children can achieve success, for instance in grammar, physics or chemistry. It is vital to have patience and pick out some sphere of activity for each child, where he can come into his own and achieve not just success, but significant success. Each child should outstrip his fellows at least in something and feel himself strong and intelligent. In order to ensure fruitful study it is important that a class should have the appropriate "intellectual context" and that the general attitude to learning should be a positive one.

Children need not only to listen to what their teachers tell them but also to be silent for a while; in his moments of silence a child is thinking and assimilating what he has seen and heard. It is very important that a teacher should not overdo his talking. Children must not be turned into passive word-absorbers. On the other hand, the mental and nervous energy of school children, especially those from the younger classes, is not a well that never runs dry. Water should be drawn from that well carefully and sensibly, and most important of all a child's nervous energy must be constantly replenished; one should also remember that it is difficult for the child to learn to work attentively and with concentration. It is of interest to note here that the Polish educator Janusz Korczak [1878 - 1942] wrote in his book; When I Again Become Small that no one can tell whether a child gets more from looking at the blackboard or looking out the window. What is more useful, more important for the child in that instance - the logical world squeezed onto the blackboard, or the world floating by on the other side of the

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window-pane? One must not tie down the child's soul but must rather pay attention to the laws of the natural development of every child, to his peculiarities, aspirations and demands.

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From the first days of school life, grades appear along the thorny path of studying which the child faces. For one child, this idol is kind and condescending, while for another, it is cruel, merciless, and inexorable; gradually children accustomed to study not for personal satisfaction, but for grades. However, I am far from thinking that grades should be banished from school life. No, there is no alternative to grades. But children should be given grades only after being able to understand that the quality of their intellectual work depends on the amount of mental energy they spend in their studies; and the main thing, in my opinion, which demanded of grades in elementary school is their optimistic, cheerful beginning. The grade should be a reward for hard work and not a punishment for laziness and neglect. If the teacher sees a low mark as a whip which can be used on a lazy horse and a high mark as a cookie, than children will soon come to hate both the whip and the cookie. Low marks are very sharp, fine instrument which the wise, experience, teacher of elementary classes always keeps in reserve and never uses; the educational wisdom consists in making sure that the child never loses faith in his own strength, never feels that he is not getting anywhere. For the small child, the teacher is a living incarnation of justice. Look into the eyes of a first former who has received a failing mark; he does not only feel unhappy but he also experiences a feeling of hostility, and often of enmity to the teacher. The teacher who gives a poor mark because the child failed to understand something seems to the

child to be an unjust teacher. Behind this deed is the explosion of the wild burst of the child's inner strength - a deep heartfelt pain; he protests, in his own way, the lack of faith in his ability. Sometimes the child's bad grades become a topic of laughter for the class; this is the most terrible thing one can imagine for the spiritual life of the personality which is still being formed. What can be expected of a person whose sense of self-worth has been dulled from childhood? One must not allow marks to be transformed into fetters binding the thoughts, of the child. With unjust giving of failing marks begins one of the greatest evils of school injustice and in the child, lying to teachers and parents. Children only resort to such tricks to conceal their failures at school from their parents, and their negligence from their teachers. The less the child is trusted, the more he resorts to the invention of lies, and the more favourable the soil for laziness and negligence. On the other hand, one must never allow children to be spoiled by good marks, as frequently happens in school.

If we were to spend a day in a school picked at random anywhere in the world, there is no doubt that at some time during the day we should hear an angry teacher upbraiding one of his charges with the words: "how many times do I have to tell you?" or "do you ever listen to what I say?" Children never respond to angry words, whatever they might imply. Such words fail to penetrate their armour or emotional impassivity or "thick skin"; a teacher's words in such a situation prove ineffective, they become nothing but a tedious exhortation. A wise teacher points to the only way out of such a situation. Before a child can be educated he has to be educable; before the teacher addresses himself directly to the child, it is essential that the child should be in a state in which he

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is capable of taking in the teacher's words. If the child is far from able, then his abilities must be fostered; indeed there is no other way. The same applies when it comes to moral guidance; harsh methods such as punishment or complaints to parents should be avoided, and instead energies should be concentrated on developing the child's capacity for listening to his teacher. A teacher who appreciates this will be more patient in relations to children. Just as he should refrain from shouting at weak pupils but give them additional help instead, so he should stop himself shouting at pupils who do not pay attention, who are incapable of listening. There is no point in reproaching a child with a lack of sensitivity or scruples; instead, patient work is required to foster his emotional responses and moral scruples, that very same emotional sensitivity which alone makes it possible for the teacher to make any headway with character training.

Imagine a child who does not know what shouting is, let alone shouting combined with invective and who naturally is petrified when he encounters it. His fear paralyses him to such an extent that he does not hear even his own name; the teacher's words lose all meaning for him, he is unable to take in what the teacher is talking about; an inhibited, fear-ridden child cannot behave normally; fear impedes even his speech and the child appears tongue-tied to the teacher. A teacher who is acutely sensitive to a child's inner world will never resort to shouting. Children can pick out anxiety, disappointment, perplexity, surprise, an indignation along with dozens of other emotional nuances in the ordinary voice of their teacher; when teachers starts shouting at children their voices are quite different from the one they use in a peaceful setting.

Nothing serves to harden and embitter a young heart more than insult. Insult brings to the surface coarse, sometimes even brutal instincts from the depths of man's subconscious. There will not be an end to juvenile delinquency until this intolerable feature of bad teaching disappears. Sometimes it seems incredible to the adult mind that a young person should have committed a cruel or inhuman act. Let us take a more careful look at this phenomenon and then we shall without doubt encounter emotional immaturity, born of a combination of environmental factors such as violence, insults, mistrust, indifference, and heartlessness met with from the elder generation.

A wise teacher should remember that in stuffing the child's head with ready-made ideas, he ties down the wings of his creative imagination. He should foster any spark of creativity whenever he finds it. Each child should outstrip his fellows in something as previously stated, and should feel himself strong, proud and creative. Low marks should never be used in the first grades of the elementary school. The child should never lose faith in his intellectual strength. Low marks, which are used as punishment, are registered not only on paper but also in the heart of the child.

The well-known German mathematician Klein [1845 - 1925] compared the secondary school student with a cannon which had been loaded with knowledge for ten years, and then after it was fired, there was nothing left inside. I remembered this grim joke when observing the intellectual labour of the student forced to memorize what he does not understand, appreciate or calls forth images and associations. The substitution of memory for thought, clear perception and grasping the essence of phenomena is a

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major flaw which stupefies the student and, in the end, kills his genuine desire to study. To avoid turning the student into a mere depository of knowledge, a treasure-chest of ready-made ideas, we must teach him how to think critically and creatively.

Churchill [1874 - 1965] wrote in his book; My Early Life about his school days the following penetrating remarks; the school my parents had selected for my education was one of the most fashionable and expensive in the country.... My teachers saw me at once backward and precocious, reading books beyond my years and yet at the bottom of the form. They were offended. They had large resources of compulsion at their disposal but I was stubborn.... When my reason, imagination or interest were not engaged, I would not or I could not learn.... In all the twelve years I was at school no one ever succeeded to make me learn any Greek except the alphabet..... Examinations were a great trial to me. The subjects which were dearest to the examiners were almost invariably those I fancied least. I would have liked to have been examined in history, poetry and writing essays. The examiners, on the other hand, were partial to Greek and mathematics, and their will prevailed. I should have liked to be asked to say what I knew. They always tried to ask what I did not know. When I would have willingly displayed my knowledge, they sought to expose my ignorance..... It is not pleasant to feel oneself so completely out-of-class and left behind at the very beginning of the race..... In retrospective, these years form not only the least agreeable, but the only barren and unhappy period in my life. This interlude of school makes a sombre grey patch upon the chart of my journey. It was an ending spell of worries that did not seem petty and I toiled uncheered by fruition; the time of discomfort, restriction and

purposeless monotony ". Winston obstinately refused to learn classical languages; this means that he had no prospects of making any progress in his studies and subsequently going onto university; the classical languages [Greek and Latin] were regarded at that time as the main subjects. He was the school's worst pupil and was considered obtuse and incapable. However, his contemporaries and later biographers both agree that his backwardness at school was caused only by his boundless obstinacy. At Harrow it was noticed that he had inherited an extraordinary memory. Once, to the amazement of masters and pupils, he receives a prize for memorizing and thoughtlessly reciting twelve hundred lines of Macaulay's Days of Ancient Rome. He knew by heart lengthy scenes from Shakespeare's plays and would never pass over any occasion for correcting a teacher if he made a mistake when quoting from Othello or Hamlet. This means that Winston would only study those subjects that he wanted to, and he rejected all the others. He even selected the teachers for whom he was willing to work, and refused to do anything with those he did not like. He broke just about every rule of conduct that was established by teachers and pupils alike. It is recorded that on one occasion the Headmaster had to reprimand him. "Churchill", the Headmaster once said to him, "I have very grave reason to be displeased with you". " And I sir", replied the boy, "have very grave reason to be displeased with you!"

There can be no doubt that Churchill was a great statesman and an outstanding gifted man. Nature endowed him with unusual intelligence, a strong will and extraordinary energy. He was brave, purposeful, resolute, versatile and remarkably efficient, and these qualities, combined with his supreme ability in public speaking and

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in writing, assured him of success in his political career.

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Today, although the efforts of many neurophysiologists to unravel the mystery of the human brain, the stage seems set for a more daring and penetrating look into that "black box", as cyberneticians call it, which hide the "springs" setting into motion all that which we call "our thought processes". The latter is defined as psychological functions reflecting objective reality and offering knowledge about properties, relations and interrelations in the surrounding world. However, we still do not thoroughly understand what is going on in the vast expanse of the human brain - in this cosmos of the human organism - when we create, think, and memorize. Yet empirical methods along with research and experimentation have provided a great deal of insight on the workings of the human brain and the psychological processes allowing numerous comparisons and helping identify ways to control at least some mental operations. One important aspect is that there is nothing in the brain of the creative person that is not in the embryo of the brain of a normal ordinary person. This means that there is no normal human being without talent and that those we call untalented are merely the people who fail to use the brain potential. It is important to note here that different types of gifts exist by the hundreds and mankind needs all of them. It may be an excellent ear for music or an exceptional memory, extraordinary combinational analysis or lightning response, a rare mathematical aptitude or artistic ability. The educational task is to develop these talents as early as possible and infuse with a zeal on par with the talent. In other words, great mysteries lie hidden in the brain of the child; which is an inimitable creative laboratory



unique unto itself, with unrestrained imagination, boundless and unstoppable in its flight. One need only to review children's drawing to see a record of the varied and many discoveries they make.

Another important aspect is the discovery of the neurophysiological basis of the human emotions; the detection in the human brain of two dynamically interconnected centres responsible for comfort and discomfort has given psychiatrists an understanding of the causes of mental disorders and clues to the biological nature of drug abuse, perhaps the most mysterious and devastating aspect of human psychopathology.

From the standpoint of neuropsychology the creative act is a cortical activity of a definite part of the cerebral hemispheres possessing at the given moment and under the given conditions optimum cortical excitability. At the same moment the rest of the human cerebral hemispheres are in a state of more or less diminished excitability. New ideas or artistic images are easily produced and differentiations, are successfully elaborated in the part of the cerebral hemispheres with optimum excitability. Thus, at the given moment, that is, so to speak, the creative part of the cerebral hemispheres. The other parts of the cerebral hemispheres with diminished excitability are incapable of this, and at this time their functions at most consist of formally elaborated ideas and mental images which arise stereotypically in response to corresponding stimuli. The activity of these parts is what we subjectively call unconscious, autonomic activity. The part with optimum activity [excitation] is, of course, not a fixed part; on the contrary, it continuously shifts all over the cerebral hemispheres,

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depending on the connections existing between the cortical centres and under the influence of the external stimuli. The territory with diminished excitability naturally changes correspondingly. "If we could see through the skullcap and if the site in the cerebral hemispheres with optimum excitability were luminous", an outstanding neurophysiologist once remarked, "we would see in a thinking, conscious person a luminous spot of oddly irregular contours and continuously changing in form and size move over his cerebral hemispheres, the rest of the hemispheres being rather considerably shaded". Now, we can add to the neurophysiologist's words, the skull is becoming increasingly more transparent to man's inquisitive eye through electroencephalograph; this is also attested by the dogs who live for a long time with transparent plexiglass window "built" into their skulls.

The same cortical process is, in essence, responsible for the other psychological phenomena connected with the creative act: doubt and intuition. Doubt is a mental state in which a person experiences a lack of confidence in the truth of something, vacillates between different points of view or opinions and is hard put to solve a particular problem. Doubt, as a function of the human brain, is a necessary condition in the research process for the emergence of new problems which must be set and resolved if human knowledge is to continue to develop. Doubt helps mankind overcome dogmatic obsessions and irrational notions which take the form of various prejudices and myths. Intuition, on the other hand, appears as a sudden solution to a practical, theoretical or artistic problem, producing the impression that it has nothing to do with the human brain. Intuition, from the standpoint of

neuropsychology, is a function of the human brain resulting from long, sustained, thought, work and from complex practical activity. It would be wrong to draw a sharp distinction between intuitive cognition and logical thought as psychological processes performed by the human brain. An intuitive thought is marked by condensed reasoning and by the realization of the most important link, particularly of a final deduction, rather than of the entire process. Intuition involves the capacity of thought to skip, as it were, some stages of logical thought, yet these interruptions in the logical process have been prepared by preceding logical analysis. In intuitive thought the process of arriving at a conclusion remains unconscious, but the conclusion itself, as a qualitatively new form of knowledge, results from the interaction of various elements in the single cognitive process. Any new idea or artistic pictorial image comes suddenly as a result of previous mental activity, of tireless quest for the new. In all cases when intuition is at work, its conscious mental activity based on knowledge and experience is instrumental in the formulating of new ideas and discoveries regardless of the circumstances which attend their emergence. Moreover, it is important to remember that not everything which is intuitively clear and evident turns out to be true. The result of intuition requires logical substantiation and verification for intuitive knowledge is not always corroborated by practice and theoretical analysis.

Creativity is an indispensable characteristic of the child's development, therefore it is only natural that through it the child gets to know the world. Creativity is always present in the life of the child and manifests itself in their games, drawings, poems and fairy-tales. The way imagination, thinking and emotions develop

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in early childhood can determine the personality as a whole and the creative potentialities of the individual in adolescence and perhaps even later on. The idea that everything originates in childhood [in early childhood at that] has a deep meaning. For researchers, however, those first few years are not only the most interesting but also the most difficult to study, because more often than not their origins are hidden from them. As a rule, an ability takes shape spontaneously and quickly, and the child's first encounters with the outside world may prove of exceptional importance to his creativity. The main and the most wonderful characteristic of childhood is that the child explores the environment through creative play. By analyzing children's drawings, listening to fairy tales made up, for instance, by a seven - or eight - year old, or watching a child play, you gain access to the peculiarities of children's thinking and imagination.

It is of interest to point out that people may experience an urge to produce something of their own quite early in their lives. Every one of us has in life a myriad of impressions and emotions, and under certain circumstances there may come a moment when one begins to build out of his experience something of his own in addition to what already exists around him. Not all grown-ups become poets or artists, however. In childhood, on the contrary, creative activity is always there and we adults should encourage children to be creative in everyday life. At times we find it almost impossible to see something the way children see it. Children's perception is apparently akin to that which people had in ancient times when they formed primeval ideas of the surrounding world.

In many respects the child is a genuine artist; he is able to see

the world from different angles at one and the same time, as if through different eyes, discarding the usual, monotonous view of things and human relations and thus getting down to their essence. It should be borne in mind that children's perceptions and thinking are not equivalent to our perceptions of and attitudes to the world. Children are clever, sensitive and complicated but not in the way we adults are. Therefore, there is no need to teach the child to do something the way we think correct instead of letting him to do his own way. The more so since we are not artists nor necessarily can use words, paints or music with mastery. While the child is making his first discoveries in the world, our major task is to help him as far as possible with these discoveries without imposing our yardsticks and judgements on him. For this reason, be more attentive to your children's requests to stay with them or to read to them and to the drawings and poems they make. They trust their works to you and check their value against you. They count on your participation, and I advise you to respond, keeping in mind the children's trust and readiness to accept your judgment, call for your absolute fairness. Beware of dogmatic education and unnecessary patronage that restrict the child. If we are incapable of helping and teaching, the best we can do is not to be in the way. I believe general precepts are of no use here because every child has an individuality of his own. Adults should rely on their intuition and experience in deciding how to act in every particular case.

In other words, adults undoubtedly can play an important part in helping children "amass" the material from which they can build something of their own. The challenge of our time, is not to clutter the memory of the child with an ever-growing burden of

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knowledge, but to train for efficient mental work and, to borrow a phrase from the language of cybernetics, assimilate some initial programme for a problem solving skill and competence in whatever mental activity, task or occupation. The accent must be on developing and refining those individual qualities which can bring the child as near as possible to the complete and consummate development of the child's brain potential. It is of interest to point out here that the Canadian pathophysiological Hans Selye, in his book From Dream to Discovery, devoted essentially to research management, expounded the fascinating notion that the mental energy content of the human brain is as great as the physical energy potential of the atomic nucleus. Thus, theoretically at least, the human creative potentials are unlimited and inexhaustible. One can boldly assert that no one knows the limits of his mind. In fact, we never come anywhere near the peak of our capacities and our brain usually performs up to a negligible fraction of its potential. Most of us are not destined to become an Einstein, or a Mozart, or a Shakespeare, to be sure, but each can grow to be a "genius" in his line of inclination and fully develop his brain potential. However, many neuropsychologists assert with confidence that all people are "genius" because each has at least something that makes him different from and in some way superior to others. Though an exaggeration, there is a modicum of truth in this. There is no normal child without talent; those we call untalented are merely the people who fail to develop their capabilities. There are different types of mental gifts; the educational task is to develop these talents as early as possible and infuse them with a zeal on par with the talent; to establish conditions which encourage the development of creative abilities.

Neuropsychologists who studied the psychological functions of the human brain in depth stated that the human brain is a system which, like any other systems in nature, followed the laws unavoidable and common to all of nature; but it was the only on the horizon of current neurophysiological vision by the high capacity of self-regulation. While various self-regulating systems were fairly well known among the product of the human brain, the human brain as a system was self-regulating to the highest degree, and also self-supporting, rehabilitating, correcting, and even perfecting. The one paramount lasting impression from studying the human brain was the enormous plasticity of its psychological processes and its vast potentials; nothing ever remained unmoved or unyielding, everything could always be achieved if only the right conditions were met. Today, through the efforts of outstanding neuropsychologists to unravel the mystery of the human brain, the stage seems set for more daring and penetrating look into the "black box", as cyberneticians call it, which hides the "springs" setting into motion all human psychological processes. However, we still do not thoroughly understand what is going on in the vast expanses of the brain - in this cosmos of the human organism - when, for instance, we create, think, memorize and concentrate. Yet, empirical methods along with research and experimentation have provided a great deal of insight on the workings, of the human brain and its psychological function allowing numerous comparisons and helping identify ways to control almost same mental operations. Backed by the great deal we know already the human brain and its mental functions, we have the courage to act boldly sometimes. In any case, we not infrequently have a clear idea of what should be delivered to the "input" to obtain what we need from the "output". Roughly speaking, we are already

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attempting to increase the margin of control over our brain. Optimistic neuropsychologists no longer doubt that with time more and more people will be able to attain the intellectual standards now possessed by an exclusive, narrow, and therefore privileged sliver of humanity - the elite. The advancement of human mind will transgress any bounds since each new generation will raise the human intellect onto a new and higher plane of excellence. If we consider that every neuron in the human brain has about five thousand connections with other neurons and may exist in a variety of intracellular states, the potential number of states and degrees of freedom defies estimation. It can be argued that any human being utilizes no more than one billionth of the capacity of his brain during his lifetime.

Overtly strong willpower shackles the emotions, cutting off the beyways needed for a creative inquiry. Accordingly, an optimal strategy for creating something combines a great sense of purpose - what Newton called the patience to ponder - with an ability to see a problem in new perspectives and to yield to hunches. This combination of commitment to an emotional freedom from a goal, coupled with an ability to overcome intellectual inertia, without turning into a sort of weather cock is the seed from which creativity is born. Human strength and grandeur lie precisely in being able to cope purposely with one hurdle after another. A person does this by his brain potential to pool all physical, intellectual and emotional resources. Moreover, the higher and more complex the barrier, the more the person's resources must be utilized, his every being strained to the extreme if necessary. At such moments of extreme mobilization, each person's creativity reaches a new higher level. History tells us that the great majority of its



outstanding personalities led lives filled to the brim with struggle, constantly having to overcome obstacles and summon up their willingness. The great Michelangelo, for instance, when painting the Sistine Chapel, used to stand on the scaffolding with his head back. Since the work was long and hard it affected him for some time so that he could not lower his head. He was unable to read a simple letter without holding it above his head. But not for an instant did he regret it, his will kept him committed to his great cause and helped him over his pain. He continued with his task and carried it through. We are now grateful to him for creating his inimitable masterpiece. But it was an exercise of his will that enabled him to get the better of his excruciating physical pain; his art allowed him to enjoy his work and gave him satisfaction. A joy a person feels after overcoming formidable obstacles provides feedback that our volition is pushing him in the right direction. So the main thing in the life is to recognize a genuine and great goal and direct our will to attaining it. Two main interconnected psychological phenomena are essential in this respect: concentrated attention and keen observation.

Attention is concentrated on some perceived or recalled object with its simultaneous distraction from other objects; i.e., it is an act of consciousness directed toward particular objects and manifests the selectivity of consciousness. The thing that attracts concentrated attention becomes the "figure" and all the rest - the "background". In concentrated attention or in being carried away by something we neither see nor hear anything going on around us. Concerning observation Pavlov ordered the word "observation" to be carved on the facade of the main building of his research centre as a constant reminder to his associates of how

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much he appreciates this human quality. Summing up his own abilities, Darwin wrote: "I think that I am superior to the common run of men in noticing things which easily escape attention, and in observing them carefully. My industry has been nearly as great as it could have been in the observation and collection of facts. From my early youth I have had the strongest desire to understand or explain whatever I observed, - that is to group all facts under some general laws. These causes combined have given me the patience to reflect or ponder for any number of years over any unexplained problem. Newton once wanted to boil an egg. Taking a watch he noted the time he started the cooking. After a while he discovered that he was holding the egg in his hand and was "cooking" the watch. But, when the great scientist was once asked how he had managed to discover the law of gravitation, he said; "because I kept thinking about it all the time". George Cuvier [1769 - 1832] defined "genius", on the basis of Newton's foregoing words, as incessant attention. Edison said: "genius is one per cent inspiration and ninety-nine per cent perspiration". Others said that "genius is only a great aptitude for patience", or "genius is mainly an affair of energy".

Everyone is acquainted with the delightful story of Archimedes, how he sprang out of his bath and ran as he was throughout the streets, crying out; Eureka! Eureka!! From this emotional burst we may gather that he achieved something wonderful even for himself. The crux of the invention consisted in a measurement being supplied by immersion in water; this was actually observed in relation to his own body and then was in idea - transferred to the golden crown [he had been ordered to find out whether a crown, alleged to be made of pure gold, had really been

adulterated with any baser metal]. The same principle is true also of the invention of the steam engine. Supposedly, Watt noticed the movement of the lid of a kettle of boiling water, and was inspired by the idea that such an event on a large scale might exert a great force. Here the relation, actually observed between a small quantity of steam and the movement of a light body, is transferred mentally to a large quantity of steam and thereby creates the idea of the movement of a heavy body. Gutenberg's invention of printing with movable type was based on bringing together the idea of the seal for stamping an impression and the idea of the wine-press for exerting powerful steady pressure. This means that the genesis of the creative act is the sudden shaking together of two previously unconnected matrices; the essence of the creative act is wrenching away an object or idea from its familiar context and viewing it in an entirely new context. When Newton thought of the theory of gravitation, the creative aspect of his thought was not found in the material facts, the sun, the moon, weight, distance, mass, sequences of numbers, etc. His originality lay in the creative combination of these familiar acquaintances. The same is true of every striking scientific discovery, every great invention, every admirable artistic production.

It is interesting to point out here that Chompers(1), who studied 740 American scientists, especially chemists, in the hope of establishing the signs by which creative - thinkers could be distinguished from the non-creative ones, came to the conclusion that the former are more strongly motivated with respect to creative success both in the present period of time and at the preceding stage of their training. This sign of the predominance of the intellectual drive over the other motives is so great that, in

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Champer's, it can be used in identifying the truly creative scientist. The less creative, in his view, is concerned primarily with finding a convenient opportunity to combine research and to find challenging problems.

Another American psychologist(2) studied sixty-four eminent scientists and came to the conclusion that all of them worked hard and devotedly in their laboratories, often seven days a week. They avoided social affairs and political activity, and religion played no part in their lives or thinking. Better than any other interest or activity, science research seem to meet the inner need of their nature. The one thing that all these sixty-four outstanding scientists have in common is their driving absorption in the scientific work. They have worked long hours for many years, frequently with no vacation to speak of because they would rather work than anything else.

In the history of science, the classic example of industriousness is provided by Edison; his devotion to the idea and extraordinary capacity for work made him an outstanding scientist. Right up to his death [at the age of 84], Edison worked intensively often for 18 - 20 hours a day. The secret of his great scientific discoveries was work, persistence and more work. In order to find a suitable material for the filament of an electric light bulb, for instance Edison and his assistants carried out 6,000 experiments, filling 200 notebooks! Another unique example is Pavlov: known to have been very punctual and kept strictly to his timetable. He got up exactly at 6 o'clock never changing anything in his established daily routine which was devoted entirely to science. He left home and came back at exactly the same time everyday, as regular as clockwork. Old ladies living nearby would often check their old

fashioned clocks by him. He modestly noted on his 80th birthday: "to be quite honest, I must admit that the natural talent of the hero of this anniversary was hardly above the average. His knowledge never sufficed. He worked hard all his life, making up for his lack of natural talent with persistent hard work". Lack of "Natural talent" is clearly revealed in the several documents.

A person's confidence in his success, in his major opportunities and his powers, is very important. Optimism engenders positive emotions, which makes for the rapid restoration of energy spent, simulates a person to overcome further obstacles, and that, in turn, strengthens the will considerably. This is the main psychological quality of the creative cast of mind. This is what leads to new discoveries and helps go beyond the limits of what has been achieved and the bounds of traditional knowledge. This cast of creative mind is based on a high emotional spur of mental activity to penetrate deeper into the uncognized.

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One should be close to one's children, on the one hand, and should also remain at a certain distance, on the other hand. At one time I believed that adults involved in bringing up children should always be "together" with children rather than "above" them. Later I came to the conclusion that the word "together", first of all, is an illusion and even in the cases in which it is asserted that closeness to children has been achieved and that no distance remains, people fool themselves; and secondly it is not always possible to act together since, from what they have in common, adults, especially parents and teachers, and children, as a result of differences in their development and experience, inevitably

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possess spheres of activities that are different as well and which take place on different planes, as it were. This "dysfunction" is both logical and natural. Furthermore, children should be aware of these differing spheres. This will teach them to respect the life and interest of their parents [and teachers]. However, in some cases adults must act "together" with children and in others must speak to them from "above". Only one thing is certain: an exclusive emphasis on only one of the opposite sides leads to a break in normal relations. An exclusive emphasis on acting "together" produces a lack of respect, and the development of egoistic attitudes among children. While an exclusive emphasis on speaking to the child from "above" leads directly to the brutal amputation of the child's individuality.

Whether he is a parent or a teacher, an experienced educator possesses the gift of pedagogical insight. One often hears the words: "I can see by his eyes", "It was written on his face", "I noticed a change in him". The younger the child is the more clearly his face reflects his desires and the easier it is to "read" on his face the inner processes of his mind. Thus there are teachers who have a sharp eye and a keen sight and are able to notice things that are hidden from the sight of others. There are also teachers who do not possess these qualities. Obviously those who can see rather than being blind, and who are able to feel and establish the child's inner state are at an advantage. In our opinion such a capacity for insight is one of the major conditional skills of pedagogy. This vision is the ability to determine a child's inner state, his fears, hopes, perspectives, and his wishes on the basis of barely noticeable external signs: [mimics, intonation and movements]. Such a capacity for insight can be viewed in the light of two of its

aspects. The first refers to a capacity to "read". This is an inner process concerned with the finding of meaning; it is a kind instantaneous processing of information with the help of experiences, analogies and comparisons. The second sphere of insight is not only understanding but includes an evaluation of behaviour as well. When a child meets our gaze he frequently also senses our attitude towards him. At the moment when we are assessing his behaviour, as he catches our own expression, he deciphers our responses. And these vary so much. There may be sadness, regret, anger, joy, love and hate, approval, encouragement, commands, etc. The expression "eyes are the mirror of the soul" applies equally to children and to adults. And since we view pedagogic insight as an interaction, a mutual relation and a two-way process, we should consider two subjects, namely, "adults in the eyes of children" and "children in the eyes of adults". Thus pedagogical insight is not a passive contemplation but it is active and operative.

It is also important to note the following: at time of great emotional stress and what has been termed "outbursts", we are especially perceptive. We suddenly see things that before we could only guess. Try to analyze your own state of a stormy response. On the one hand, in a single instance you have suddenly seen things that earlier had been hidden. Your insight was concentrated on this so intensely and so successfully that everything else moved into the background. And yet side by side with such deep insight there was also a complete blindness. If a person is not able to overcome this blindness at such times, that failure to see the entire background, which is no less important than the truth that had been suddenly perceived, he will not be

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able to make use of this new information, will not even retain it and understand its meaning.

We think that we know a child well since our knowledge matches with his outer behaviour. But occasionally we suddenly learn that our knowledge was mistaken and that the child is altogether different from what we had thought. Children possess a remarkable ability to adapt to the reactions of adults, to quickly perceive their wishes and demands, and as they adjust to them they take on the appearance that adults wish to see. Paradoxically, it is precisely this property of adaptation that makes it possible for them to perceive their true selves. Because of our pedagogical blindness we fail to see the second layer of facts and then we wonder:

How could hypocrisy in the child have happened? The cruelty of the father was, in essence, the cause of his son to become hypocritical: which became the norm in the boy's behaviour. The boy "genuinely" wished to please his father since he feared him. And when every child is guided by fear, negative experiences will inevitably build up inside him. Fear may be compared to narcotics. Having tried to influence others through fear, one finds it difficult to stop. For fear produces a false sense of relief, helps overcome a feeling of helplessness, and creates a semblance of action. Yet everything that is bad in fear - irritability, rudeness, cruelty, - produces a negative responses in children. And eventually they begin to accept fear as an unavoidable evil.

Pedagogy should have at its command all various means of exerting a positive influence on children, strong enough to



overcome any harmful influence they might come up against. In other words, education should not be restricted to the classroom, it should influence the child's entire life, governing his behaviour both in the family environment and in the company of friends. The basic principle of profoundly human pedagogy is the observance of this rule: place the most exacting demands on the child and treat him with the utmost respect. The child must know to be chivalrous, harsh, kind or ruthless. He must learn how to obey a command and how to give orders to his peers. He must have staying power, self control and an ability to influence others positively and constructively. Only in conditions of trust and confidence in the child could such means as reward and punishment produce desired educational effects.

The combination of the most exacting demands with the utmost respect for the child are part and parcel of the same thing: they are not two different things. By placing demands upon the child we show our respect for his strength and abilities, and by showing respect for him we make demands on him at the same time. It neither is a respect for something extraneous, nor something outside society. It is the respect due to another child who is taking part in the educational endeavour. And now after this, a few words about punishment: Punishment is, of course, not very beneficial. But where punishment has to be meted out the teacher has no right to suspend it. To punish is more than a right, it is a duty in cases where it is imperative to punish. In other words, a teacher may either punish or not, but if his convictions dictate he must punish, he has no right to refuse to do it. Punishment should be proclaimed an educational measure as natural, straightforward and logically acceptable as any other. The traditional attitude towards

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punishment as a necessary evil must be resolutely rejected; the notion that punishment is an evil which for some reason is necessary does not quite agree with either logical or theoretical views. There can be no talk about evil in cases where punishment will do good, where no other measures can be adopted, and the teacher feels that it is his duty to punish; this belief that punishment is a necessary evil turns the teacher into a practising hypocrite. The teacher must apply punishment where it ought to be applied and where it can do good. However, this does not mean that we are asserting the advisability of punishment in all and every case; punishment must settle and eliminate conflicts and not create new conflicts. The evil of the traditional punishment lay in the fact that while eliminating one conflict it creates another one, the settlement of which was necessarily more involved still. However, the aim of the punishment must never be the infliction of moral or physical suffering; and to avoid the traditional logic; I shall punish you, you will suffer, and others watching you suffer will say to themselves: we can see you suffering, and we must take care not to do the same.

We would like to point out that pedagogical tact, which is very important, is not a synonym of politeness. Tact in pedagogy means the ability of the teacher not only to avoid conflict with the child, but, if necessary, to face this conflict in order to resolve the contradiction that may arise in the correct way. At the same time tact is a sense of proportion, the conscious ability to use the right amount of influence, the ability to use discipline in time, and, if necessary, to weigh up the advantages of one means over another. Being simultaneously demanding and kind is what constitutes the complex skills of the teacher whose pedagogical methods are not

an end in themselves but are used to create suitable educational conditions. It is not the teacher who chooses the means but it is life itself, the situation and the spiritual conditions of the youngster that determine the methods and tactics of education. And the ability to become aware of the demands and joys of the life of the child, of the flutter of the child's heart, that is the bases of the pedagogical art. On the other hand, the teacher should not come down upon the child with destructive criticism of his efforts. Sarcasm and irony as much as rude and sharp judgments may extinguish in the child the wish to engage in useful activities that could help his development. Maximalism always drains the personality, if it unrestrained, and the teacher should be aware of this. The child needs always intellectual support; without recognition talent and abilities more often than not weaken and die away. Recognition and support and a critical appraisal are productive forms of social communication that have made possible the formation of the high level of the psychological processes in the child.

The formula - "there are no trifles in upbringing" - is just as significant as any other pedagogical principle. What seems to be a trifle to an adult, is important and essential to a child. Furthermore, the entire course of our daily associations is often built around trivialities. The teacher should always remember that the great strength of genuine pedagogy that even the negative moments are useful for instruction.

Every individual is always a person living in a certain social epoch, belonging to a certain social group, occupying a certain place in the system of relations established in a certain society. His

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psychological processes are mediated by the specific nature of his social ties to the outside world. In early childhood an individual enters a ready-made historically formed system of social relations; and his subsequent development takes place in a specific social environment. This means that neuropsychologists are not satisfied with the study of the individual "in general", as such, existing outside time and space which was characteristic of the old, traditional psychology; their attention is drawn to the specific, real, historical and socially conditioned individual.

The psychological processes of the human being consist in that they develop during the social process of mastering the socio-historical experience of mankind. The child masters through experience what has been elaborated during the long history of mankind. The thought, the memory, the perception, and the attention of the child are essentially determined by the mastering of speech, knowledge, and certain modes of social activity. In the history of humanity not only the means for realizing psychological functions developed but also a specific way formed for the transmission of these means, and the transmission of the socio-historical experience to subsequent generations also developed and became more complicated. It is this specific way [course] that constitutes education in its broadest aspect. In this way education plays a determining role in the process of the psychological development of the child. In other words, the distinction of the human being consists in the mediated character of his psychological activity. Mediation becomes possible because the human being makes use of symbols in his psychological activity [words, figures, etc.], in the same way that in the external, practical activity he uses [material] tools or instruments. The similarity

between [material] tools and symbols [the psychological tools] lies in the fact that they are differently oriented. Material tools are directed to the outside [to the environment], they should bring about a change in the object, they are means of the external activity of the human being, directed towards the mastering of nature. A symbol [a psychological tool] is directed internally [psychologically], not changing anything in the object, it affects the behaviour of the human being. The mastering of nature and the mastering of behaviour are, of course, connected, since the changing of nature by man changes the nature of man himself. The use of symbols, i.e., the transition to mediated activity, reorganizes the entire psychological activity of the human being in much the same way that the use of tools alters the natural activity of the organs, increases and widens the possibilities for the psychological activity immensely. This means that the psychological development of the human being takes place in the process of mastering all of these means [both tools and symbols: material instruments and psychological ones] through education: learning and teaching.

Analyses have shown that there are three basic types of teaching. In the first type the necessary relations are first communicated to the students in the form of general principles, formulas, rules, or algorithms. In the second type the essential relations are established by the students themselves, in the course of understanding and utilizing data. In the third type students are trained to use the requisite procedures and taught to find the attributes with the help of which the necessary relations among things and phenomena are established. In this case the students themselves will identify the essential relations within the data

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provided that they are equipped with the necessary methods of mental activity. Psychologists have compared all the three ways of assimilating cognitive structures. Research would seem to indicate that other conditions being equal and the teaching of principles provide somewhat better results. In other words, it is more effective in developing the student's thinking.

Is thinking formed during the process of learning if one has in mind an ability to solve independently cognitive problems, and to independently find the solution to problem situations? A hypothesis was put forward which suggests that the inability to think independently is connected with the fact that during learning sometimes an unproductive method of introducing knowledge is used: very often formally logical methods of generalizing are taught to young school children. The basic course which was followed for many years by the primary school was the formation of generalization by means of transition from the concrete, the particular to the general, the analogous, the similar. As a result, an ability for abstract thinking either was not formed in the child, or else, the formation of this ability was realized only in an elementary way, and often not through the school method of learning but in spite of it. This hypothesis was based on extensive research and testifies to the fact that for the young school children concrete thinking, the transition from the particular to the general - the inductive course - is not convincing from this point of view. Learning can be constructed in another way and other results may be obtained to show that the formation of concrete thinking is possible on the basis of a transition from the general to the specific.

The educational process is carried out in the class and with the

help of the class. But what exactly is this instrument for educating the child in the psychological respect? And does the word "instrument" not sound technical? For, after all, a class is made up of very different living people, striving for one goal but willing to achieve it by different means. To understand the general laws of the emergence and functioning of the class is to obtain the possibility of purposefully and effectively influencing the individual and to restructure, if necessary, the entire psychological climate in the class.

It is generally believed that academic activity is the main type of group activity of the school children in the class. The importance of academic activity is hard to overestimate. Well organized academic activity promotes the assimilation of essential knowledge and the development of skills, the formation of the pupil's views and independence and the shaping of the individual's moral traits, convictions and ideals. One of the most important aims of any educational system at the present time is the formation of academic activity on a high level making it possible to develop the pupil's cognitive activity. At the same time, certain specific characteristics of academic activity cannot help affecting the structuring of the interpersonal relations of school children. Although apparently joint activity for the teacher works directly with the whole class - academic activity mainly envisages as individualized process of mastering knowledge and is therefore, essentially, the sum of individual academic activity, minimal and episodic. This is particularly the case with the lesson which to this day remains the main element of school work. Interaction during the lesson is regarded as an undesirable and, frequently, a punishable form of behaviour. It is true that various forms of

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mutual help are encouraged, and rightly so, during extra-curricular activity. Nevertheless, as we have already said, the lesson remains the predominant form of the educative process in school, but it is during the lesson that the academic activity of a pupil today is least of all collective. Active emotional involvement in the affairs of others, sympathy, empathy, are all part of emotional participation, which cements the interrelations between generations in the family, leaving no room for indifference, callousness in the family. Immediate responsiveness in times of trouble is a form of emotional participation and evidence of a person's willingness to cooperate and support. Harmonious family relations presupposes reciprocity in the manifestation of emotional participation. It is usual, of course, for parents to manifest this trait by offering help and supporting their child [help in studies, teaching him practical and sporting skills, showing an interest in his affairs]. However, is emotional participation always inherent in the parental emotions? Unfortunately, it is far from always mutual.

Adult life is full of complicated, sometimes simply difficult, or dramatic situations. If we want our son or daughter to become closer to us [note that we are talking of the child becoming closer to parents and not the other way round, since, as a rule, this is unnecessary], then the first role is not merely to witness but to be direct participants in adult experience. What is more, this should be done as early as possible, straightforwardly and boldly, providing comprehensible explanation [depending on age].

The family is a unit of society with a vital social function of bringing up the younger generation and ensuring personal



happiness, something which demands mutual moral responsibility and effective mutual help. Securing the personal happiness of each family member and bringing up fully developed citizens of society is what characterizes the activity common to the whole family, the aims of which stretch beyond the limits of relations within the family and are socially valuable and socially fixed. However, there is nothing wrong if a family disagrees on films, for instance, the virtues of a football team, the daughter's hairstyle or the father's new suit. But it is unfortunate if there is disagreement in views on how to spend holidays, how to deal with money, which friends are suitable and which are not, etc. And it is quite wrong for there to be constant disputes about the behaviour of children in various situations. Like a sensitive instrument, a child reacts to the slightest disagreement between adults. The barely noticeable dissatisfaction of a mother with a father's strictness, the pursed lips of a granny, who leaves the room slamming the door behind her, not to mention direct arguments about a child's behaviour in his presence, will all be used by the child to strengthen his [or her] influence on the older members of the family.

Unity of demands made on the child, unanimity in the appraisal of his behaviour, are vital principles of education within the family. But what if an act of misbehaviour has been committed and it is necessary to respond immediately, with no time to work out a common opinion or come to an agreement? What is one to do? Probably, in such cases, it is a good idea for one of the adults to take on the responsibility of making an immediate decision and later, when the adults are alone, to discuss the situation and the decision taken. Even if mistaken, there is an advantage in the long run, since the child or the adolescent will have seen the family's

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**firm stand and authority. This is what is most important.**

## **General Concluding Remarks**

- 1 -

In order to give a complete picture of the human brain as an organ of mental life, it is essential to use the historical comparative approach, that is, during the long course of biological and social evolution both phylogenetically and ontogenetically. This approach reveals the essential cortical differences between the structure of the human brain and the cortical structure of the brains of higher animals. It is also important to take as the basis of the analysis of the construction of the human brain not its traditionally anatomical parts, but the new neurophysiological principle of functional systems.

The socio-historical aspect of neuropsychology stems from man's special nature compared with the whole organic world, as a social creature, and as a fundamentally new phenomenon in the history of our planet, bringing into the world thought, language, art, science, and social relations, and making an active influence on nature, in short as the creature of civilization and all its attributes. With this approach man becomes the centre of attention, not in himself, but as a particle of mankind which is regarded as a definite social and natural stage in the development

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of all matter and the Universe, comparable with the preceding stages of inorganic and organic evolution. This means that humankind is not an independent kingdom but an organic part with animal, vegetable and mineral kingdoms. This is organically connected with the three main physical attributes: upright walking, free upper limbs and a highly developed brain.

The human brain is formed of tens of thousands of millions of nerve cells. Within that enormous aggregate local associations and hierarchically organized substructures are distinguishable, and within them complex systems of functional substitution operate. The brain is not a sum total of these billions of neurons, but a system consisting of them and organized by them, and they perform, processes and organize information reaching the brain from the external world. The human brain is the highest product of the biological evolution in the animal kingdom. The macrostructure and microstructure of the human brain and of its separate fields and deep structures have now been quite well studied.

It is important to note here that when a system exceeds a certain level of complexity, it has to "foresee" or "predict" the course of future events in order to behave adequately in the surrounding medium; otherwise, when encountering changes in the conditions, it will progressively lag behind them in its responses by virtue of its complexity and the impossibility of its being rapidly restructured. The human brain is obviously a system of that complexity. This provides the possibility of an objective explanation and forecasting of the phenomena and processes taking place around the human being in nature and society that

have provided it with a constantly widening spectrum of potential adaptive possibilities.

Neurophysiological interest in the study of the human brain, as an organ of mental activity, has sharpened considerably in the past few decades. The brain, this most sophisticated of instruments, capable of reflecting the complexities and intricacies of the surrounding world, how is it built and what is the nature of its functional organization? The human brain has come to be regarded as a highly complex and uniquely constructed functional system, working on new principles. It is now almost a half of a century since the appearance Gray Walter's well-known book: The Living Brain, in which, for the first time, an attempt was made to find an explanation of the intimate mechanisms of the working of the human brain and the principles governing its functions were expressed. A few years after this scientific event, a second book appeared from the pen of the eminent anatomist and physiologist Magoun: The Waking Brain. This book records the first attempt to approach the brain, on the basis of the latest neurophysiological data, as a system responsible for the waking, active state, the most important condition for all forms of behaviour. A few years later after the appearance of The Waking Brain, a third book appeared: The Working Brain by the outstanding neuropsychologist Luria, summing up the main achievements of modern neuropsychology. In 1984 a fourth book appeared: The Learning Brain, edited by Simon and Asratyan presenting the findings of the research carried out at the Institute of Higher Nervous Activity and Neurophysiology [USSR:Academy of Sciences]. Its general theme is the neurophysiological mechanisms of the learning process and memory.

## *General Concluding Remarks*

From the standpoint of modern neuropsychology the human psychological functions are complex functional systems; they take place through the participation of groups of concertedly working brain structures, each of which makes its own particular contribution to the organization of this functional system. Accordingly, the first essential must be to discover the basic functional units from which the human brain is composed, and the role played by each of them in the complex forms of mental activity. There are solid grounds for distinguishing three principal functional units of the brains whose participation is necessary for any type of mental activity; with some approximation to the truth they can be described as a unit for tone or waking, a unit for obtaining, processing and storing information arriving from the surrounding world, and a unit for programming, regulating and verifying mental activity. Any psychological process always takes place with the participation of all three units, each of which has its role to play in formation of any psychological function. These three units are hierarchical in structure; and each of them is itself also hierarchical in structure and consists of three cortical zones built one above the other. The primary [projection] area [in the second functional unit for instance] receives impulses from or sends impulses to the periphery. The secondary [projection-association], is where incoming information is processed. And, finally, the tertiary [zones of overlapping] - the latest systems of the cerebral hemispheres to develop - is responsible for the most complex form of mental activity.

We have examined some modern ideas regarding the three principal functional units of the human brain and tried to show the role of each of them in the organization of the complex mental

activity. However, it would be a mistake to imagine that each of these three units can carry out a certain form of mental activity completely independently; each psychological function is always a complex functional activity and takes place through the combined working of all three brain units, each of which makes its own specific contribution.

Over millennia of his evolution, the human being has developed a tertiary layer of the cerebral cortex. There is very little of it in apes and even in the human infant. It does not mature until the age of four to seven. It is probably the most specifically "human" part of the human brain. The tertiary layer of the human cerebral cortex is also called the "crossroad" since it is located at the intersection of the occipital, temporal and parietal parts of the brain; it is a crucial border area that brings together information about the world received from the brain's most skilful and reliable agent - sight, hearing and touch. The integration of this data creates a complete and accurate picture of what is taking place around us.

This means that in the process of evolution, tertiary zones developed above the secondary and primary zones. These integrate vision, hearing and touch, process the information coming from various sense organs, assimilate all this material, relate signals from various sense organs [or analyzes] and create schemes into which all these data are filtered.

It is of importance to note here that the frontal lobes play the same function, they receive impulses from all the areas of the cortex, from the reticular area and from the subcortical modes.

### *General Concluding Remarks*

They account for some thirty per cent of the volume of the cerebral himispheres, but they perform no sensory of motor functions. But actually they are very important sections of the cerebral cortex; they make it possible to integrate the impulses from different sense organs and thus enable the human being to plan his actions and create complex programmes.

All organs and parts of the organisms have their representations in human cerebral cortex; the sense organs - in its sensory areas and the muscles - in its motor areas. The more important the organ is for the animal or the human being, the more space does its representation occupy in the cerebral cortex. The largest area in the cerebral cortex of the pig, for instance, is occupied by the representation of its snout; in the cortex of the horse - that of the nostrils; and in the cortex of the sheep - that of lips; whilst in the monkey - it is the visual area of the cortex and the representation of the arms and the tail that predominate. In man the centres of speech and practical activity have a particularly specialized representation occupy very large parts of the cerebral cortex whose greater part is associative, unifying the work of the brain as a single unit.

It is a firmly established fact that there are two major tertiary regions in the cerebral cortex of man: the posterior, situated at the border of the parietal, temporal and occipital regions or the cortex - and the anterior, situated in the prefrontal area of the cortex. The posterior region is mainly responsible for the perceptual images of external world, while the anterior is the brain mechanism of conception. Both of them are uniquely human cortical formations distinguishing the human brain qualitatively from the



brains of the rest of the animal kingdom.

The first tertiary [overlapping] region [which includes Brodmann's areas or zones: 5, 7, and part of 37, 39, 40] is the cortical formation or structure which lies on boundary between the occipital [visual], temporal [auditory], and post-central [parietal] parts [lobes] of the cortex. It is responsible for perception enabling neuronal groups of several analyzers to work simultaneously and cooperatively. It is predominant in the brain of the potential artist. The second tertiary region [which includes Brodmann's areas: 9, 10, 42, 44, 45, 46] is the cortical formation which constitutes the frontal part of the cortex and is responsible for the most generalised forms of abstract thinking and creative imagination.

This means that modern neuropsychology is radically different from the classical of the last century concerning the working of the brain. On the one hand, there was the assumption of the localization of the psychological functions: each function was localized in a specific cortical zone. On the other hand, there was the holistic approach assuming that the brain functioned as a whole. The time was long passed to consider the psychological processes as a result of either strictly localized brain centres or the "mass action" of the brain in which its parts were regarded as "equipotential". From the standpoint of neuropsychology the brain is formed from three principal functional units or blocks. However, the work of the brain is so complex that such simplification is admissible; that every type of mental activity involves all the three main units. The first is the "energy unit" regulating tonus and wakefulness and is located in the midbrain,

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which evolved, historically, earlier than the other parts. The second unit located in the occipital, temporal and parietal parts of the cerebral hemispheres; it receives, processes and stores impressions coming from the surrounding world through sensory organs. It consists of three sub-units: the visual [the occipital], auditory [temporal] and the general sensory [parietal]. It has a historical structure, with primary, secondary and tertiary sections [zones, regions] in each of the sub-blocks. The first divides the perceived image of the world - visual, auditory and tactile - into elementary properties: roundness or angularity, pitch or loudness, vividness or contrast. The second section synthesizes these properties into whole images, and the third fuses the impressions received from the various sub-blocks, i.e. from the visual, the auditory, the olfactory and the tactile sub-blocks.

There remains the third block located in the frontal lobe; its role is the programming, regulation and control of all human psychological processes; the frontal lobes receive impulses from all the areas of the cerebral hemispheres [the cerebral cortex and the subcortex]. They account for some thirty per cent of the volume of the cerebral hemisphere, but they perform no sensory or motor functions. They are very important sections of the human brain.

The new elements brought in by neuropsychology is an approach to the human brain as a complex functional system equally opposed to narrow localisationism and to the "globalism", i.e. the view of the brain as a homogeneous whole. No function is exclusively confined to a particular group of brain cells; any psychological process should therefore be approached in terms of

the distribution of various functional systems throughout the brain. In other words, every area of the human brain makes its own distinct contribution; and if any of them is knocked out, several functional systems of which that area is an essential part are shattered, in a different way each time.

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We should consider the fact that the period of the development of the human organism from birth to maturity is the longest of the various representatives of the animal kingdom. Why the period of development of the human organism is so long is one of the great mysteries of nature. It is as if this period were necessary for the development, strengthening and education of the human brain: the material foundation of the human psychological processes. One must not forget in the face of all the important tasks facing the elementary school, that the teacher is dealing with a person going through an active period in the formation of his central nervous system, especially his brain. One must not look at the brain of the child as a living arrangement ready-made for the teacher, for the assimilation of knowledge, memorizing, and storing information. The brain of the seven - eleven - years old child is practically in a continuous process of rapid development. And if the teacher forgets that one must care for the development of the brain of the child, for the strengthening of the nervous cells of the brain, then studying will dull the child.

On the other hand, if everything the child does in school is easy for him, his mental functions will become lazy in time leading in the long run to corruption with a frivolous attitude toward life. It seems strange, but lazy thinking occurs most frequently in talented

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children if the process of studying is not challenging to them. And lazy thinking occurs most frequently in the first classes when the talented child masters with ease what, for other children, is connected with a measure of mental effort, and essentially loafs around. It is interesting in this connection to state the following remarks of an American school boy: "I drove everyone - my teacher, parents, myself - up the wall. I finished the Algebra book in a couple of weeks and had nothing to do the rest of the time except make trouble and I guess I must have decided to become a gifted trouble maker. That year, mother spent more time in principal's office than she did in her kitchen."

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Human emotions occupy a central place in neuropsychology. Emotions reveal themselves, from the standpoint of neuropsychology, in a strong focus of excitation in the cerebral cortex. The contents of human emotions, both individually and collectively, are socio-historical in origin. A strong emotion is always accompanied by a strong excitation in the cortex focusing on a particular object. This makes it possible, for instance, not only to overcome physical pain but also not to feel it. There are interesting cases on record among them, for example, in the 5th century BC, a Greek warrior had run 42 Km from Marathon to Athens, and after reporting the victory of the Greeks over the Persians, dropped dead. [The marathon race at the present time is run in commemoration of that feat]. During a certain battle a courier galloped up to Napoleon and handing him a message rolled in the saddle. "Are you wounded?" asked Napoleon. "No, I am killed", answered the courier, dropping dead from the horse. It is also of interest to note here that hard emotional experience

was manifested in the well-known case of bleeding ulcers on the arms and legs ["the wounds of the crucified Christ"] of the French religious fanatic Louis Lateau.

We are beginning to realize that emotions are much more potent in shaping public sentiment and opinion than information and reason; and historical study shows that primitive religions owe their power in determining beliefs and action to their ability to reach emotions by rites and ceremonies, by legends and folklore, all coved with the traits that mark works of art.

Hitler obtained mastery in Germany, for example, by procuring for the emotional elements in human nature and organized outlet. He first organized them in the "National Socialist Party" by means of combination of strict discipline under autocratic leadership with unregulated brutal lawlessness towards everything outside the party.

The post-war Germany was a defeated and humiliated nation is a well-known fact. This condition of affairs provided the practical basis of Hitler's appeal is also a familiar fact. Germany was down because it was weak; let it become strong and it would rise. This single consideration is trumpeted forth by Hitler on every conceivable guise. Germany had a mission in the world to fulfill, and strength, power, was the absolute prerequisite which would enable it to do its bounden duty. Strength was virtue and virtue was power; weakness was, fundamentally, the only vice. Quotations from Hitler's writings and speeches and information about his deeds, have made his gospel of force, scientific facts about race were as nothing in comparison with a simple easily

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grasped, symbol which could be used as a weapon in an emotional appeal to fanatic action. Hitler's contempt for intellectual measures and for science, except when used as an effective technical instrument in propoganda, are the adverse side of his belief in the power of emotion to reach the masses, and of his conviction that when "intellectuals" are enormously stirred they fade into the mass. For it is characteristic of intense emotion to rule out discrimination; emotion is an all or none state. We fear and hate all over; the emotions are inherently totalitarian. When they are once kept excited they control belief and every semblance of intellectual operation. Indifference, apathy, Hitler called his chief foe; excitement, and always some new source of excitement, is the consistent quality in his inconsistent policies. Since emotion is total, it knows only black and white, not intermediate shades. Hence the ideal value of Germanic blood needed for effective presentation, extreme and wholly dark opposite. Skillful emotional manipulation of symbols probably reached its climax for long ages in Hitler. If it is true, as is sometimes asserted, that he is himself pathological, it is certain that, in the phrase of the street, he is "crazy like a fox", since his own emotional disturbances, if they are there, are of a kind which enable him to arouse similar disturbances.

Blood, race, instinct, passion, in the vocabulary of Hitler, are names for life, for the vital; and they are a name for what move men to act en masse; leaders above meanwhile exercising with consummate skill the most approved methods of organization and control. The mass is not a new phenomenon. Neither is the authoritarian leader. What is new is a mass which is not a mere amorphous crowd but in which the most extraordinary effective

skill in every kind of organized effort is combined with the psychology of the crowd. That the content which fills and gives toughness to the "idealism" has moved from the intellectual [or quasi-intellectuals] to the emotional and passionately impetuous, without losing its combination with technical efficiency and organization, is indeed new. It is the difference which has given victory in Germany to the ideology of Hitler; he built a giant and ponderous apparatus of "total propoganda" which cynically manipulated the consciousness of German youth and sought to turn them into deaf - blind - dumb and unthinking slaves. Blind fanaticism in the execution of orders by a whole hierarchy of fuhrers, multitude of rituals specially designed to lull political consciousness, were used to reduce the Germans to cruel unthinking robots executing orders. Propogandists whipped up nationalistic hysteria and political psychosis to serve the Fuhrer's; demagogy and social ties form the backbone of the party ideology. Those who did not yield to the constant brainwashing were physically destroyed; some left the "paradise" of the Third Reich and others went underground. The party apparatus firmly held in its hands the entire people and tried to train them in the spirit of anti-humanism; everything - bullet and gallows, gasses and bacteria, fire and water, hunger and cold - was adapted by the party for extermination.

Fascism is, historically, the offspring of the present century anti-democratic trend. It is neither an exclusively German nor an exclusively Italian social phenomenon. It is international in character. In different countries it existed, and still exists in different forms. However, it was the German experience that brought out in sharp relief the most typical features of fascism as

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a political system. The principal feature of facists, whatever country they many come from, is emotional rejection of human conscience, of personal moral self-control and personal responsibility for criminal actions. Having absorbed the simplistic dogmas of racist theory, the cult of violence and amoralism justifying aggression and genocide, the facists willingly obey, wihtout any questioning, criminal orders, the more so, those orders accord with their personal base motives; craving for power, vanity, cupidity, adventurist inclinations, and sometimes elementary unprincipled cynicism and readiness to kill their own mothers, if the orders were to do so. Fascism also uses much more prosaic means for recruiting "supporters", such as terror, intimidation, chauvinistic demagoguery, corruption on both large and small scales. Consequently, a pernicious influence of fascism on the social mores manifesting itself not only in the general climate of cruelty, progroms, and informing. Duplicity becomes a mass phenomenon. Fascism creates a spiritual atmosphere in which many intellectuals prove defenceless in the face of the onslaught of the irrationalistic and anti-humanistic ideology of fascism.

It is of interest to mention here Hitler's own extraordinary flexibility in choice and use of means - combined, as he himself has said, with fanatical inflexibility of purpose. Hitler raised "opportunism" to the point of genius. A less apparent but equally skillful aspect of his ability in "opportunism" is found in the way in which he borrowed and adapted to his own use all ideas provided they reinforced any angle of phase of his appeal. He showed his sense of timing in the ideas he used as weapons, and he never allowed consideration of logical consistency to keep him from



appropriating any idea that would serve him as a weapon. ["Opportunism" is altogether too weak a word to convey the meaning I want to bring out]. On the other hand we must not take his documentaries uncritically. Untold kilometers of film have perpetuated the crowds hysterically applauding Hitler; yet those who did not want to acclaim the Fuhrer, who stayed at home, did not get in the fame, and neither did hundreds of thousands of inmates of prisons and concentration camps, not to mention many thousands of emigres.

Understandably, not only fifty years ago but in these days too, the entire range of questions on the essence of fascism, its roots, sources, and modes of influencing people, especially youth, is of an acute social interest. In other words, true anti-fascism assumes not only hatred for but also an understanding of the nature and roots of fascism, the causes of its influence on the youth in particular, its manifestations in these days, and also of the ways of fighting to denounce it.

No matter what may be the case with the impulses and powers that lead the creative artist to do his work, works of art once brought into existence are the most compelling of the means of communication by which emotions are stirred and opinions formed. The theatre, the movie, the musical, the press, the picture gallery, eloquence, popular parades, common sports, recreative agencies [and, of course, school] have all been brought under regulation as part of the propaganda agencies by which dictatorship is kept in power without being regarded by the masses as oppressive. It is inherent in any regime that demands that total allegiance of all its subjects; a totalitarian regime is committed to

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the control of the whole life of its subjects by its hold over feelings, desires, emotions, as well as opinions. Thus it is the very things that seem to a democratic cast of mind the most obnoxious features of the totalitarian state are the very things for which its advocates recommend it. These "cultural" means are employed to reinforce unmitigated coercion and intimidation [the wide use of purges, executions, concentration camps, deprivation of property and means of livelihood, etc.]. Thalleyrand said that a government could do everything with bayonets except sit on them. This cynical declaration is at least a recognition that other means are inevitable. On the other hand, history shows that more than once social unity has been promoted by the presence, real or alleged, of some hostile group. It has long been a part of the technique of politicians who wish to maintain themselves in power to foster the idea that the alternative is the danger of being conquered by an enemy.

Aside from the fact that the "cultural" means of communication, especially the press, may distract with trivialities or be an agent of a faction, or be an instrument of inculcating ideas in support of the hidden interest of a group [all in the name of public interest], the wide - world present seen is such that individuals are overwhelmed and emotionally confused by publicised reverberation of isolated events. With respect to information and understanding of social events, the situation is that on one side of an immense number of undigested and unrelated facts, reported in isolation [and hence easily coloured by some twist of interest] and large untested generalizations on the other side. The generalizations are so general in the sense of remoteness from the events to which they are supposed to apply

that they are matters of opinion, and frequently the rallying cries and slogans of factions and groups. They are often expression of partisan desire clothed in the language of intellect.

The "cultural" means of communication have broadened indefinitely the range of information at the disposal of the average person. It would be foolish to deny that a certain quickening of sluggish minds has resulted. But quite aside from having opened avenues through which organized propaganda may operate continuously to stir emotions and to leave behind a deposit of opinion, there is much information about which judgement is not called upon to respond and where even if it wanted to, it cannot act effectively so dispersive is the material about which it is called upon to exert itself. The average person is surrounded today by ready-made intellectual goods as he is by ready-made foods, articles, and all kinds of gadgets. The effect of the increase in number and diversity of unrelated facts that now play pretty continuously upon the average person is more easily grasped than is the influence of popular generalities, not checked by observed facts, over the interpretation put upon practical events, one that provokes acquiescence rather than critical inquiry. One chief reason for underestimation of the influence of generalities or "principles" is that they are so embodied in habits that those actuated by them are hardly aware of their existence. Or if they are aware of them, they take them to be self-evident truths of common sense. When habits are so ingrained as to be second nature, they seem to have all of inevitability that belongs to the movement of the fixed stars.

During the course of recent decades, research in the

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psychology of memory became one of the most actively developing fields of investigations. A generation ago memory was regarded as a relatively simple process of imprinting, storing, and reproducing traces. These ideas have now been known to be grossly inadequate, and neuropsychologists now have begun to interpret remembering and recalling as complex acts of information process, taking place in consecutive stages and resembling cognitive activity in character. This means that memorizing, as well as retention and retrieval of traces, really comprise a very complex form of mental activity, possessing a complicated brain structure. This radical revision of our basic ideas of memory, has of course, brought with it the need to study its brain structure more carefully and to undertake the more detailed analysis of the brain mechanisms concerned with the imprinting ["recording"], the storage and recalling of traces, as well as the conditions causing them to be forgotten. The careful neuropsychological analysis of the role of individual brain systems of mnemonic activity is still only in the earliest stage. However, the outlines of the neuropsychology of memory began to emerge and this section of research began to contribute both to the development of the general neuropsychological theory of memory and its various aspects. Memory is proved to be a complex functional system, active in character, taking place as a consecutive series of events in time, and organized on several different levels of brain structure. On the other hand the storage of imprinted traces and the process of their reproduction or recall are no less complex than the process of imprinting itself. In other words, recalling is not understood as a simple outpouring of previously imprinted forms but rather as a complex process of active searching. It is thus seen as a special form of cognitive

activity. A person who has to recall a series of words read out to him, for instance, must first choose the necessary connection or necessary component from among a large number of possible alternatives, inhibit the outpouring of random, irrelevant components, and pick out the essential ones.

I have mentioned the profound changes introduced by neuropsychology into our views of the processes of remembering and reproduction [recalling] material imprinted previously. Equally radical changes have occurred in our views of forgetting. At earlier stages of research focussed on memory, associated with the work of the German psychologist Hermann Ebbinghaus [1850 - 1909], forgotten was understood to be the spontaneous extinction of traces, increasing gradually in intensity as time goes on. The views on forgetting as passive process of trace decay soon ceased to satisfy neuropsychologists. Even had these views been suitable for explaining the processes taking place in the circle of events more recently called "short-term" or "operative" memory, they proved quite unsuitable to explain some of the phenomena in the sphere of "long-term" memory. Observations have shown that the traces of this "long-term" memory can be preserved for very long periods of time [perhaps throughout life], and that those which have apparently been forgotten may under certain conditions be revived and be manifested quite clearly. Neuropsychologists consider that the facts of "forgetting" traces of long term memory can be explained by the influence of irrelevant interfering impressions or of irrelevant, interfering forms of activity. The fact that the brain always receives "irrelevant", interfering impressions continuously causes neuropsychologists to question the basis of the classical "trace forgetting curve" obtained by Ebbinghaus. It

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may result not from trace decay, but from inhibitory of irrelevant stimuli or interfering reminiscence which are almost impossible to take account of in special circumstances, and which can only be characterized by the term "irrelevant".

The facts at the disposal of modern neuropsychology and neurophysiology concerning the neurological organization [or the cerebral mechanisms] of memory offer convincing proof that the psychological function is undertaken by a complex system of different parts of the human brain, working together and each making its own specific contribution to the process as a whole. In other words, this process has a very complex structure; and it is a grave mistake to regard it as a simple recording, storage and retrieval of information. Recall is an equally complex process of choosing the necessary systems of connections from all the possible alternatives.

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The sounds of speech cannot be regarded as simple or complex groups of tones or noises that are distinguishable merely with the aid of sufficiently acute hearing. Modern linguistics tells us that the articulated sounds of speech differ radically from sounds not related to speech. Two features characterize the sounds of human speech; in their origin and structure they are always organized in a definite objective language system, and consequently, they are special, generalized sounds - physiologically, they are always complex and are produced with the aid of the phonation - articulation apparatus, without which they can be neither pronounced nor perceived.

Neurophysiological knowledge of the cerebral organization of speech processes is based on experience gained over more than a century when, Broca, in 1861, expressed the view that motor speech is "localized" in the posterior zones of the third of the superior frontal gyrus, and when in 1873 Wernicke linked the posterior third of the superior left temporal gyrus with the function of sensory speech, the first important steps were taken toward a scientific [neurophysiological] understanding of the cerebral organization of speech activity. These two neurophysiological discoveries, of decisive importance at the time they were made, initiated many subsequent investigations in an attempt to determine which cortical zones participate in the organization of speech and which forms of speech disturbances arise in lesions in various parts of the human brain.

Neuropsychology regards speech as a special means of communication using language for the transmission of information. It regards speech as a complex and specifically organized form of conscious activity involving the participation of the subject formulating the spoken expression and of the subject receiving it. Consequently, it distinguishes two forms and two mechanisms of speech activity; expressive speech and impressive speech. Such speech activity [whether expressive or impressive] is clearly a highly complex neurophysiological process incorporating several different components. The general characteristics of speech activity, as a special form of social communication, represent only one aspect of this process. However, there are other aspects of speech; as a tool for intellectual activity, and finally, as a method of regulating or organizing human mental processes.

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In its outward manifestations, language is the result of the work of our speech organs; at the same time it serves all spheres of social life. Without it the life of society would be impossible, even in its simplest forms. The realization of speech is neurophysiological but the function of language is socio-historical. Therefore it can not be included exclusively within the range of neurosciences or socio-historical sciences. However, it is commonly held that linguistics is a humanitarian science and a basic humanitarian discipline. The view took shape historically. In fact, linguistics remained a humanitarian science for two and a half thousand years. Little attention was paid to the neurophysiological aspects of language and its production by human speech apparatus. Yet without speech organs that produce sounds there would not, of course, be any linguistic communication. However, the complex the latter is, it comes down to the work of the speech apparatus and is perceived by sound analyzers. Without a sufficiently developed brain [the organ of thought], language communication would not have developed. Attention has been paid to that aspect of the matter only in recent decades.

Language emerged as the human brain developed and human society was created. Human language is a unique phenomenon among all other systems of communication. It is distinguished from them as a qualitatively special phenomenon. In human society language ensures expression and transmission of all information amassed by mankind.

The interaction of cerebral processes and the work of the peripheral speech centres, and of the auditory analyzer, in the speech flow is very intricate and almost instantaneous, so that a



separate consideration of their functions leads to schematisation of the process. But such a schematisation is inevitable in any inquiry that aims at reconstructing the activity of any functionally complicated system. In our case it is a matter of the interaction of several such systems. But assuming that neurophysiological [and biochemical] processes taking place in the nerve cells of the brain that are expressed at the macro-neuropsychological level in the formation of concepts, the peripheral speech organs are responsible for the sound expression of the concept. While the organs of hearing provide perception of the vocalization in the speech flow, it is best to begin any further exposition with a survey of the fundamental structures of the brain itself and the changes in them in the course of the evolution of the human brain as part of the animal kingdom. Not only are the brain structures but also the volume of the brain itself, and the tremendous increased number of the neurons in the cerebral cortex are indicators of sorts of the level of the psychological processes and linguistic communication of mankind. Three moments can perhaps be noted with some certainty. The first thing that strikes one is the increase in the height of the brain, which is associated with the growth of the cerebral cortex in which the higher psychological functions are performed. Furthermore, a growth of the frontal region can be noted in connection with the increased in the height of the frontal lobes, and certain reduction of the parietal region which may be considered a reorientation of the brain's functional systems; and finally, an extension of the brain's associative functions.

It is important to note here that neurolinguistics, a new branch of neuropsychology, deals with the neuropsychological analysis of

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encoding and decoding of verbal communications and their disturbances in local brain lesions. Every expression, from the standpoint of neurolinguistics, is constructed from a series of constructive elements, each of which is an essential condition for the entire neuropsychological process. However, there are good grounds for supposing that every condition involved both in the complex process of formation of expression [the encoding of thought] and in the no less complex process of decoding [or understanding] of communication is the result of close collaboration between a series of brain systems. Further, the evidence suggests that each of these brain systems plays its own unique and special role in this complex neurophysiological process and makes its own special contribution to the construction of the functional system on which it is based.

It is an established neuropsychological fact that the human brain is a highly complex functional system that requires the constant participation of three basic units in order to carry out its functions, as previously stressed. One of these functional units is responsible for the waking state of the cortex and provides for prolonged selective forms of activity; the second functional unit is that for the perception, processing and storage of information, while the third functional unit is concerned with the programming, regulation and control of neuropsychological activity while it is in progress. However, every act of behaviour, every process of perception, memorizing, or thinking requires the combined operation of these basic functional brain units; each of these functional units is responsible for this process. It is also an established neuropsychological fact that recent investigations rejects the idea of direct localization of complex forms of psychological activity in

local areas of the brain; the basic assumption is that complex psychological functions are carried out by functional systems, based on certain component factors. Being systems, these factors are not "localized" in circumscribed areas of the cerebral cortex but are distributed in the cortex [and subcortical formations]. Moreover each area of the cortex [or subcortex] makes its own specific contribution to the organization of every complex functional system. The adoption of this approach clearly makes it impossible to accept the "anti-localizationism" which regards the brain as a single undifferentiated entity. Naturally, one must approach the question of the brain mechanisms of speech activity and the processes of encoding of verbal communication from the same position.

When we turn to problems associated with discovering new potentials in the human organism we are primarily concerned with the manipulation of the human brain and the psychological processes. Neuropsychology still faces the task of explaining many features of the human biological nature that remain a mystery to us. The greatest mystery is the human brain and its psychological functions. Modern neurophysiology is in a process of intense growth, that, some neurophysiologists believe will produce during the next half century solutions to the major questions raised in studies of the human brain activity not only in the cellular and molecular level, but also at the integral level requiring a study of systemic linkages and interactions. The human brain's organization, which already at the molecular level, underlies a specific capacity of neural cells for systematic functioning, sustains human's higher nervous system and the processes relating to the psychological functions. To a substantial extent it is determined

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by hereditary factors; hence the problem of deciphering the neurophysiological code of the neuropsychological phenomena whose solution will help achieve a more effective utilization of the human brain's potential.

This raises many complex neuro-scientific and socio-historical problems that lead neuropsychologists, who accept the view that efforts to influence the functioning of the human brain [through chemical impulses, electrical impulses, for instance] are permissible, to express serious apprehensions with regards to possible negative consequences. In particular that should attempts be undertaken at some points to make intellectual abilities the product of chemical and training laboratories, than it is entirely possible at a subsequent higher stage of neuropsychological development we will learn that we have produced irreversible changes in the human brain that unfortunately it will no longer be possible to remove.

The challenge is to enhance intellectual activity by using more effectively the brain's existing resources which for the time being hidden. Yet while man's future is thus linked to the perfecting of the psychological functions of the human brain, neuropsychology has still not answered the question whether new capacities of the brain may emerge in the course of the natural evolution of some of its parts. An answer to this and other questions will make possible more accurate forecast of man's future in connection with the development of his neurophysiological, intellectual and emotional processes and potentials. Today it is difficult to state exactly in what direction and especially through what methods this development will take place. It is of interest to note here that

cybernetic modelling of man's neurophysiological mechanisms and their technical reproduction in computers with a view to creating an artificial intellect's functions opens new possibilities for the minds "feedback influences" on brain neurophysiology. True, many problems in this area remain unclear or controversial including the very definition of "intellect". In particular, some researchers deny altogether the possibility of creating an "artificial intellect or intelligence". One thing is clear: biocybernetic research will contribute to a substantial widening of man's intellectual and psychophysiological possibilities.

The analysis of the neuropsychological phenomena under neuroemotional pressure, in particular of those involved in operating equipment, reveals not only considerable human capacities that have not been sufficiently studied but also substantial individual psychological difference among persons. Recognizing these differences and studying general neuropsychological phenomena accompanying man's activity offer one of the major approaches not only to psychophysiological adaptation but also to the development of corresponding abilities. It is important to note here that, as Delgado(1) rightly observed, "the direction of the colossal forces discovered by man requires the development of mental qualities able to apply intelligence not only to the domination of nature but also to civilization of the human psyche". In particular, an even greater role will be played by psychophysiological research based on the study not only of the neurophysiological prerequisites of the psyche, but especially of the broader interrelationship of the social interrelationship of its social mechanisms in the context of human activity. At a certain stage of the next century [the "age of biology"] neuropsychology

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will acquire a predominant significance, for it is particularly effective in making concrete and explaining the complex of sciences that study man, the natural - biological foundations of his existence and the higher manifestations of his psychological processes. The question that arises in this connection is, would hom sapiens come to be replaced by some kind of "superman"? Would the human race enter a new stage in its evolution at which in a substantial measure man will be created artificially - "manufactured", with the help of genetic engineering and bio-cybernetics which would produce a "superman" possessing extra- sensory and extra-intellectual properties?

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The term "eugenics" [from the Greek eugenes: well-born] was introduced by Galton in 1869, in his book: Hereditary Genius: An Inquiry Into Its Laws And Consequences. The book demonstrated that man's heredity, like that of any other living creature, is governed by common laws of genetics. The author also defined the problem of improving human heredity by increasing and selecting useful qualities and reducing or overcoming harmful ones. Since the latter's frequency correlates with the frequency of marriages between close relatives, efforts to limit such marriages, bio- chemical consulting and other measures help reduce the incidence of harmful forms of heredity. That is the aim of the "negative" eugenics, which largely coincides with modern medical genetics. "Positive" eugenics, on the other hand, aims at a broader objectives, namely, developing a "new man" through a selection of genotypes among the progeny of persons possessing exceptional mental and physical qualities. That branch of eugenics has been used [sometimes in contradiction with the humane intentions of

its advocates] by various reactionaries and racists, particularly by the theoreticians and practitioners of the facists" racial hygiene" and genocide. Naturally, the dispute that this brought to the ideas of eugenics resulted in failure, even though in many respects it relied on genetically well-established hypotheses and the authority of prominent biologists known for their humanistic views [Herman Muller, John Haldane, Julian Huxley and others]. It is true that the basic postulate of the "classical" eugenics -that concerning possibility of guided development, through selection, of persons with exceptional intellectual abilities - was disproved by modern genetics and by the science of man, his individual and historical development. This caused many advocates of eugenics to reconsider some of its original dogmas and to turn, in particular, to social factors in human development.

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From the standpoint of neuropsychology, there are several types of central nervous system distinguished by the properties of the basic cortical processes: [excitation and inhibition] atrength, equilibrium and mobility. In addition to the general types of the central nervous system inherent in man and animals, neuropsychologists distinguish specific types inherent only in man: intellectual, artistic and intermediate. In the intellectual [theoretical] type, abstract [conceptual] cast of mind is predominant, whereas in the artistic, artistic [perceptual] cast of mind is predominant. The intermediate type combines the qualities of both in due measure. The probability of a nervous ailment is clearly connected with the type of the central nervous system. However, the problem of distinguishing the typological peculiarities of the human central nervous system presents

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considerable difficulties since the behaviour of man is conditioned not only by the inborn properties of the central nervous system, but also by the social influences which have always acted on the human organisms.

Determination of the natural types of the central nervous system therefore requires a consideration of all influences to which the given organism has been subject from the day of birth.

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In explanatory, persuasive psychotherapy - based on neuropathology - the physician must strive to activate the patient's central nervous system and increase its tone; he must aid in removing the pathological bonds in the cortical dynamic structures and in creating normal ones. A favourable friendly emotional atmosphere of the entire medical personnel must be set in every hospital; the entire personnel must be wholly devoted to the interests of the work because in any medical institution not only the words of the medical personnel, but also their behaviour with respect to the patient and the entire hospital regimen, with all of the stimuli connected with it, are of psychotherapeutic importance. This last circumstance should be borne in mind when the medical personnel, which must help the physician in everything he does and maintain his prestige in the eyes of the patient, is chosen. Thus we see that not only the physician's prestige and his attitude to the patient but also the impression he makes on the latter already in large measure determine the success of the treatments since the very personality of the physician is essential. This means that every physician, whatever his speciality, is first of all a psychotherapist; every interview between the physician and



the patient concerning the latter's ailment contains, in most cases, elements of verbal suggestion made by the physician to the patient. A closer acquaintance of physicians with methods of direct and indirect suggestion might prevent the harm involuntarily inflicted by the physician, when by a careless word or superfluous diagnostic terms, corresponding medical certificates, laboratory analyses handed by the patient, etc., he sometimes unwittingly provokes in the patient a series of new morbid symptoms or supports the existing ones thus negatively affecting the patient's mind: [a simple intonation may sometimes impart meaning to a meaningless word due to which this word uttered by the physician may cause a psychic trauma. Moreover, a gesture alone may frequently prove more eloquent than an uttered word. The physician must therefore be able not only to speak to the patient but also to keep the patient quiet. Thus, there are many ways in which the patient may be affected iatrogenically. That is why the physician must always be tactful with the patient and strict with himself and with those around him.

From the point of view of neuropsychology, the psychological phenomena of suggestion and autosuggestion are based on a concentrated excitation in the cerebral hemispheres of the human brain which has become predominant. Thus, observing that some people influenced the behaviour of others by personal example, direct order, persuasion and suggestion. Suggestibility expresses itself in a greater or lesser subordination of the higher psychological processes of a person to the influence [verbal or non-verbal] of another carried out, however, not on the basis of reasoning or logical motivation, but by means of absolutely unaccountable subordination to influences. One must not regard

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the influence of one person on another by reasoning as suggestion. Verbal influence perceived critically cannot be suggested. On the other hand, verbal influence perceived passively without criticism may easily become suggested, even though it may contradict past experience and be severed from present reality. The passivity with which the content of the verbal influence is perceived may be due to the high authority of the speaking person, or to the effectiveness with which these words were said or, lastly, to the lowered tone of the cerebral cortex weakened by disease; fatigue, etc. The best way of struggling against suggestibility is, therefore, the maintenance of an active state of the cerebral cortex.

Neuropsychologically, the force of suggestion [and autosuggestion] is determined by the degree of concentration of the process of cortical excitation in a definite region of the cerebral hemispheres. In certain cases with a lowered cortical tone the limitation of the excitory process may be accompanied by a very strong inhibition of the remaining sections of the cerebral cortex which represent the basic interests of the entire organism, its integrity and its existence. Suggestion or autosuggestion may be so potent that under certain conditions the organism may even be destroyed without putting up the least physiological struggle [as an example one can cite the state of various religious and political fanatics: the martyrs who not only patiently endured but even gladly submitted to suffering. This is a vivid proof of the power of autosuggestion]. Autosuggestion may give rise, for example, to symptoms of imaginary pregnancy in which a number of complex vegetative - endocrine changes occur in the woman's organism under the influence of the stimuli connected with abstract thinking [which is a cortical function of the frontal lobes of the human brain]

and lead to the appearance of external signs of pregnancy [active slate of mamal, deposits of fat in the abdominal walls, etc.] resulting in a simulation of pregnancy. In other cases, autosuggestion produces phenomena of stigmalization [in some religious fanatics] in the form of definite changes in the skin, etc. These neuropsychological facts substantiate the methods of reliving pain by means of verbal suggestion and autosuggestion used in recent years not only in small but also in big surgical operations. Moreover, by corresponding verbal influence it is possible, in certain cases, to change the attitude of man to his family life, day-to-day and business situation, which traumatizes his mind.

Owing to the entire preceding life of the humankind a word is connected with all the external and internal stimuli coming to the cerebral hemispheres, signals all of them and can, therefore, evoke all the actions and reactions of the organism which these stimuli produce. By combining with certain stimuli in the individual life of man and thus forming primary and then secondary and even higher-order chain of responses the word acquires the nature of very many - sided complex stimulus which is individual cases capable of exerting a very powerful general and special influence on the cerebral cortex. It has long been generally recognized that under certain conditions a verbal influence alone may evoke the strongest emotional reactions in man capable of leaving an imprint on the rest of his life and activity. It is not without reason they say that "a word can make or break a man". It has also been known for a long time, for instance, that under certain conditions it is possible to put a person to sleep by direct influence of the word "sleep", i.e., to provoke in his organism the enormous

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reorganization which lapses into a neurophysiological state of sleep. This means that the word can really produce changes corresponding to its content in the human organism. In part, the word "sleep" can put the cerebral cortex of the human brain into a state of partial cortical inhibition corresponding to the state of suggested sleep, during which considerable endocrine and vegetative changes really take place in the human body similar to those that occur during its transition to the state of natural sleep. It is important to note here that the strength of the verbal suggestion is, in the final analysis, determined by the social [semantic] significance of the word acquired by the given person in his past life experience.

Summing up: the word is as real a stimulus as any other stimulus and, at the same time, is more all-embracing than any of the others. By virtue of its signalling physiological and social [semantic] significance the word [the verbal stimulus] plays a unique part in the complex of man's higher psychological functions. The word replaces, reflects, and generalizes the meaning of the concrete stimuli coming from the external and internal environment. At the same time, it serves as an important means of creating a complex system of abstract ideas based on "word signalization": and has manifested general continuity throughout many centuries of the history of mankind. All processes going on within the organism are actually reflected in the cerebral hemispheres of the human brain. The internal environment of the human body can therefore be influenced through the cerebral hemispheres. Under certain conditions verbal stimulus can call into existence a series of simple and complex physiological reactions. Moreover, depending on the meaning with which the word is charged, the word can evoke

in the activity of the human organism a development of the most diverse positive, negative and even perverted reactions. An analysis of clinical observation reveals the possibility of effectively influencing the state and activity of the cerebral cortex and subcortex by means of a word. The data testify to the considerable effectiveness of verbal influence exerted on patients both in the waking state and during suggest sleep, provided this influence is properly established on a sound pathogenic basis.

The physiological mechanisms underlying psychotherapy mechanisms are based from the standpoint of neuropsychology, on the fact that the cerebral cortex of the human brain is an organ that establishes temporary bonds not only with the external world, but also with the processes occurring inside the human body. It forms a magnificent dynamic system which not only establishes conditional bonds, both with all systems, tissues and organs of the human body, but also receives stimuli from the intrareceptors located in all internal organs. This explains why verbal influence affects such a wide range of the most diverse physiological and biochemical processes going on within the human organism. In addition, clinical material has shown that the nature of the functioning of internal organs and systems actually depend on the tone of the cerebral cortex, the state of equilibrium of the basic cortical processes [excitation and inhibition] and, lastly, on the proper functional relationship between the cerebral cortex and the subcortical area of the human brain. Thus, eliminating disorders of the functional states of the cerebral cortex leads to normalization of the activity of the affected internal organs and systems.

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The emotional factor plays a very essential role in the effectiveness of psychotherapy. The adjacent subcortical area of the cerebral hemispheres of the human brain having to do with emotions constantly interacts with the cerebral cortex with the result that the adjacent subcortex sends powerful impulses to the cerebral cortex, changing it and maintaining its tone. At the same time an active state of the cerebral hemispheres negatively inducts subcortex, i.e., generally retards its activity, whereas a retarded [inhibited] state in the cerebral hemispheres frees or positively inducts the subcortex and increases its general activity. Consequently, by making use of suggested emotions, we can alter the tone of the cerebral cortex in their direction, i.e., raise or lower it. In other words, we have an opportunity to a certain extent to control the state of the cerebral cortex and, at the same time, the state of the entire organism.

Psychotherapy is one of the oldest methods of treatment, and great importance has long been attached to it. The important part played by the psychological factor in the development of morbid states and in their treatment had been pointed out by many outstanding medical workers. At the present time, in the light of the fact progress of neuropsychology, the possibility of favourably affecting the patient and the morbid processes in his body by the suggestion of the physician is now, no longer doubted, and the mechanism of the verbal influence is sufficiently clear. The main reason impeding the physiological substantiation of psychotherapy in the past was the dualistic view of the nature of the human being prevalent in philosophy and psychology at that time. It was primarily expressed in the subjective psychological understanding of the laws governing psychological processes both

in their normal and pathological manifestations, this ["philosophical"] understanding severed from the physiological basis. It was only with the development of neuropsychological approach to the human psychological functions that psychotherapy entered on a new path which has made possible the neuropsychological understanding of the underlying brain mechanisms and which has opened new and extensive practical possibilities. Neuropsychology has created a neurophysiological basis and has discovered the cortical mechanisms of the higher psychological processes, permitting of a scientific understanding of the essence of psychotherapy and its proper medical application.

Only on the basis of neuropsychology have we now become able to disclose the concrete structure of a neurosis and the cortical mechanism of its origin and development. The achievements of neuropsychology have forced us radically to change our approach to the study of neuroses and the use of psychotherapy with the result that psychotherapeutic aid, as it is administered today, has become an efficient method of treatment. It is important to note here that psychotherapy is effective not only in the cases of functional disorders of the higher psychological processes, but also in psychogenic disorders of the physiological functions of various organs and systems of the human organism. The use of psychotherapy along with other medically substantiated methods of treating the sick is now absolutely necessary for medical science. Acquaintance with psychotherapy is important not only to psychoneurologists but also for physicians in all other branches of medicine because in the light of the neuropsychological theory of the unity of mind and body and

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somatic disease is indissolubly connected with the state of the patient's psychological processes.

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As to the neurophysiological phenomenon of mentally retarded children [or oligophrenics as doctors call them: the Greek words "oligo" - small and "phrenos" - mind] they are children suffering from a severe brain disease while in uterus or in early childhood and this has disturbed the normal development of the brain and produced serious anomalies in mental development. Many neuro-physiologists interested in mental retardation have been inclined to widen the concept of oligophrenia drastically. Frequently different types of feeble-mindedness in children have been included in the group of the feeble-minded and intellectually deficient oligophrenics. There have also been different points of view regarding the origin of oligophrenic. Some neurophysiologists have attached critical significance to heredity. Others have correctly pointed out that oligophrenic feeble-mindedness has the same symptoms of brain injury as aphasia, and apraxia and that the study of it requires a consideration of the time when the injury occurred and its locus. Recently neurophysiologists have talked less of the inherited nature of oligophrenia and more of them are beginning to accept the view that it derives from external pathological factors which disrupt the normal development of the brain. Very recent work has appeared which demonstrates that oligophrenia may result from the effects of infection, intoxication, or a disturbance of the metabolism of the developing foetal brain. It is also known that the pregnant mother developing German measles may result in a disturbance of the normal development of the foetal brain. It is



also known that oligophrenia sometimes arises from an injury to the embryonic foetus or from an injury to the brain in the early development stage of an infant.

There are two clinical variants of oligophrenia: microcephaly and megalcephaly. Microcephaly [an abnormal smallness of the head] owes its origin to early closure of the cranial sutures arresting development of the brain. Megalcephaly [or macrocephaly is an abnormal development in which the skulls are abnormally large, owing to an accumulation of fluid in the brain.

Naturally these gross changes in the structure of the brain of the child-oligophrenic invariably evoke changes in the psychological processes and lead to a significant disturbance of the normal development of the physiological and psychological functions of the cerebral hemispheres. As a result of this it is clear that the whole behaviour of the child-oligophrenic will be disrupted. But, in particular, the cognitive processes are underdeveloped and these processes are associated with the complex aspects of speech activity and with abstract thinking. This means that the pathological change in the child - oligophrenic's leads to a gross disruption of his mental development.

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Many things happen to us in dreams. Their capricious "logic" gets us into incredible situations, reunites us with half-forgotten childhood friends, with the dead, with members of our family in quite a different guise from what we are used to. We may think we are flying or, even without flying, land up in extraordinary places. From ancient times people have been interested in what

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dreams are and in their relationship to reality. This interest was first aroused by the peculiarities of dreams. The "dream world" is a remarkable one, often having no resemblance to the real world. Dreams are often entertaining, fantastic and wonderful. This has led to such expressions as "I never even dreamt of this", "It looked like a dream".

In former times the incomprehensibility of dreams made people look upon them as something "supernatural". Before neuro-psychology offered a scientific explanation of dreams, people considered them to be mysterious, prophetic. Thus was born the legend of "true" or "prophetic" dreams. The interpretation of dreams became a hot bed in which various prejudices and superstitions flourished.

Dreams, in essence, are an unusual combination of past impressions; or, which is the same thing, a combination in a most unexpected manner of the traces of former stimuli received by the human brain. The greatest source of dream material is the store of ideas, recollections, and impressions retained by our memory. The neurophysiological basis of memory is the traces left in our brain by previous received stimuli. In dreams these weak traces of former stimuli turn into vivid images evoke various emotions. At the same time the principle of "selection" of material from dreams may be of the most diverse nature. Everything we have seen, heard, or felt, anything we experienced, leaves a trace in our brain and is retained by our memory. During dreams parts of these traces may be stimulated by one or another cause; the images are dug out of memory's store-house to take the form of a dream. Thus we see that dreams bring us nothing essentially new, and that

there is nothing in them that the individual has not experienced or thought of in the past. That this so is vividly confirmed by the nature of the dreams of people in whom the perception of some sense organ has been absent from birth, such as blind or deaf. Dreams usually appear when the process of cortical inhibitions in the human brain is not sufficiently deep nor intensive and does not involve all the sections of the cerebral hemispheres of the brain. Such cortical inhibition takes place especially in the frontal lobes responsible for abstract thinking. The general result is a disturbance of the coordination and interaction of the different parts of the cerebral hemispheres. Hence the replacement of the orderly mental activity internally unified by the frontal lobes of the cerebral hemispheres, characteristic of the waking state, by the chaotic, absurd thoughts typical of dreams, on the one hand, and the concrete, vivid, sensual shapes, on the other hand [the graphic form of dreams]. The same explanation may be applied to other characteristics of dreams, such as the uncritical nature and disorderliness. The frontal lobes, being the carrier of the higher psychological function, abstract thinking, chiefly determine a person's capabilities, his ability of correctly estimating his perceptions, of establishing correlations between his perceptions and impressions on the one hand, and the former experience and reality on the other. Since deep cortical inhibition involves the frontal lobes, as already stated, the dreamer does not notice the absurdity of dream events. This also, to a certain extent, explains the chaotic thought in dreams, the substitution and merging of images and the development of unrestricted absolutely uncritical fantasies. It seems that human life, whether in dreams or in our waking hours, is sometime permeated by the bright light of human consciousness. The question of the distinction between the

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"perceptions" in dreams and the perceptions of the waking brain becomes a primary and fundamental problem only on assumption - that the human being builds all his knowledge of the surrounding world and of himself from a mosaic of mental experiences of direct external influences. "Life is like a dream", says Bertrand Russell in his book The Human Knowledge: Its Scope and Limitation using this phrase to discuss the fundamental theoretical impossibility of distinguishing dream from reality. A dream, like life, is what anyone who had experienced the happy moments of creative inspiration in his dreams would say. Dreams are life, an inseparable part of it, determined by the same foundation as all man's conscious activity.

Understanding the real living individual not as a point of departure but as the result of all world history up to the present means individualisation of the social and understanding individuality as a social phenomenon. Perhaps this is the only way we can more or less imagine the individual's consciousness as the ability not only to perceive but also to know the surrounding world, and not only to know but also to create a new world that does not yet exist, and create it not only in his waking hours but in dreams as well. Any attempt to define human consciousness in the narrow limits of the traditional mind-body problem runs into the insoluble problem of creativity. The information reaching the human brain and then floating to the surface in the images of the human memory, in the chaotic flashes of dreams - all this in some way or another fits the spatial-structural explanation of the interaction of neurons of the human brain, and so on.

The mental is, in essence, the external world itself imprinted

in the brain in the form of "nerve copies"; man's creative ability is a function of the brain. The human consciousness is not the mere processing, storing and emission of information. Consciousness is only real when a person also sees in the world that which does not exist or will never exist there without strenuous human activity, but which can be created in the world and according to its laws [knowledge!]. Even the dreams we have are not mere memories, not deliberate combinations of past images. In dreams our consciousness, having escaped the control of rational judgment that checks our every step against the perceived world of things, has free play and creates people characters, circumstances, moods, and sometimes even new scientific ideas, new music and new poetry.

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That the human brain plays a very important role in every disease needs no proof in our days, and he who has no knowledge of neuropathology [and psychiatry:neuropsychiatry] cannot understand the course of any disease as a whole. Neuropathology and neuropsychiatry are closely related disciplines primarily because the human brain is the main subject of study of both. Neuropathology is concerned primarily with lesions of the anatomy and physiology of the human brain; Neuropsychiatry studies disorders manifested in impairment of the cognitive and emotional activity of the brain. In other words, neuropsychiatry deals with the psychological functions of the brain. The development of neuropathology and neuropsychiatry as independent clinical disciplines has been closely connected with the studies of the normal anatomy and physiology of the human brain. Both of the xxxxxx human neuroses are functional diseases

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of the human brain. The development of a human neurosis is usually associated with prolonged emotional stress which makes excessive demands of the basic nervous processes [cortical excitation and inhibition] or of their mobility. This leads to overstrain of the human brain and derangement of the psychological processes.

Emotional disturbances manifest themselves in abnormal increased emotionality including such states as euphoria and depression. Euphoria is an exaggerated sense of well being. Persons in a state of euphoria are in high spirits and see everything as though through rose-coloured glasses; They laugh a great deal and are content with everything. The pathological state of this emotionality is often observed in cases of organic affections of the brain. On the other hand, depression is a state opposite to euphoria. Patients move about slowly; they are melancholic, see the dark side of everything, often feel there is no sense in living. However, in both abnormal cases the amount of sugar in the blood changes, the viscosity of the blood alters, the vessels in the brain, heart, lungs and kidneys dilate. Neurophysiologists point out that, in addition to the several types of the central nervous system common to both man and the higher animals, there are also three purely human types of the central nervous system: the abstract or theoretical type, the artistic or perceptual type, and the intermediate. Consequently, there are three types of human neuroses: psychoasthenia, hysteria, neurosthenia. Psychosthenia usually develops in persons of the theoretical cast of mind, i.e., with a predominance of the frontal lobes in their cerebral cortex. The main clinical manifestations are overanxiousness, an inferiority complex and obsessive compulsive states.

Psychosthenics live in a world of constant doubts; the doubts increase with the increased complexity of the problem facing them.

Hysteria mainly develops in persons of the artistic cast of mind, i.e., with a predominance of the sensory regions of their cerebral cortex. The clinical picture of hysteria varies very widely and its manifestations sometimes resemble the symptoms of other mental diseases. The patients are excessively emotional, and their behaviour is very largely determined by their emotions. Their concepts are also largely coloured by their emotions; and an inclination for fantasy is one of the traits of this character. The character of hysterics has many traits in common with that of children. The frontal lobes of the cerebral cortex of a child is as yet insufficiently developed, and the subcortex plays an important part in the child's behaviour. In hysteria the subcortex easily rids itself of the influence of the frontal lobes owing to the latter's weakness with the result that hysteria is marked by increased emotionality. Neurosthenia usually develops in persons of the intermediate type of the central nervous system. The leading symptom in the clinical picture of neurosthenia is "stimulatory weakness". The patients exhibit increased excitability and fatigability and have to rest soon after they begin working. They find it difficult to keep their emotions in check; they may violently react to an insignificant remark and use sharp words, but usually calm down very soon. They find it particularly difficult to restrain themselves and wait. The ability to concentrate the attention diminishes. Sleep disorders are very constantly observed in patients; they are light sleepers; they frequently have unpleasant dreams. During the day they are drowsy and somewhat

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indisposed; in the morning they do not feel refreshed as do healthy people.

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The direct cause of death is usually cardiac arrest which may be provoked by damage to the heart or to the cerebral centres which regulate the function of the cardio-vascular system. Another cause of death is respiratory arrest. The first to become extinguished in the process of dying is the function of the central nervous system. The extinction begins with the cessation of the activity of the cerebral cortex followed successfully by that of the interbrain, midbrain, medulla oblongata and the spinal cord, i.e., the older parts of the central nervous system in their development the later they become extinguished.

Agony is characterized by disordered activity of the central nervous system and disturbances in all the vital functions of the organism - irregular and intermittent respiration, weakened heart action, relaxation of the sphincters, drop in temperature, and, not infrequently, loss of consciousness. Agony precedes clinical death and may last from several hours to 2 - 3 days. Clinical death is characterized by the deepest depression of the functions of the central nervous system. The metabolic processes are not noticeably disturbed, the energy reserves become depleted, but the changes in the tissues are still reversible, for which reason restoration of the vital functions of the organism is sometimes possible during clinical death which lasts 5 - 6 minutes. But with the appearance of irreversible changes in the tissues, which first occur in the higher parts of the central nervous system, a state of biological death [true death] sets in.



To restore the vital functions of the dying organism, the heart is massaged, artificial respiration is administered and adrenalin is injected into the heart. A new method of a complex of measures aimed at restoring the vital functions of the organism has been elaborated and is now very successfully employed. It consists of intra-arterial pumping of blood with adrenalin and glucose in the direction of the heart and simultaneous administration of artificial respiration. The vital functions may be successfully restored during agony or clinical death. Restoration is impossible when death is the result of a severe and protracted disease with deep, irreparable damage to vitally important organs such as the brain, heart and lungs.

An important part in pathogenesis is played by disturbances in the interrelations between the central nervous system and the internal environment of the organism. The dependence of the functions of the internal organs on the activity of the higher parts of the central nervous system was repeatedly observed by clinicians. On the one hand, we know about the effects of various emotional experiences on the heart action, respiration and digestion: for example, we know of cases of cardiac paralysis caused by distressing experiences, changes in the respiratory rhythm to sudden fright, digestive disorders connected with mental depression and chronic lack of appetite. On the other hand, there are well-known examples of bodily afflictions overcome by passive emotions.

Overstraining of the higher nervous activity and a clash between the basic cortical processes - excitation and inhibition - in the cerebral cortex caused by different external conditions may

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lead to changes in the functional relations between the cerebral cortex and subcortex. The resultant negative disturbances dysfunctions of various organs, for example the respiratory and cardiac dysfunctions, arise in blood pressure, spasms of the coronary vessels and intensification of the motor function of the intestines. The verbal stimulus may also be a pathogenic factor in the human organism. It is well-known that by verbal suggestion it is possible to disturb the usual course of physiologic processes - slow down or accelerate cardiac activity, constrict and dilate vessels, alter gastric secretion, increase metabolism and even develop inflammatory processes. A verbal suggestion may evoke various emotions [fear, fright] and even a state of psychic trauma which considerably affects somatic functions. Such diseases as diabetes, for example, may develop on this basis. Moreover, psychic trauma may hasten the manifestation or aggravate the course of a disease already in progress. Careless use of words by a physician may sometimes produce psychic trauma in the patient and therefore provoke diseases - so-called iatrogenic diseases [from the Greek - iatros:physician, and genesthai:to be produced]. Attentive and tactful treatment of a patient has very favourable influences on the patient and helps to restore the functions impaired by disease.

As the human organism and its central nervous system, the organism's reactivity to a number of toxic substances increases and its defence reactions alter. The peculiar reactivity of the infant, especially his tendency towards digestive and metabolic disorders, is due to the insufficient functional maturity of the cerebral hemispheres. On the other hand, the state of the higher nervous activity is an important factor in raising or lowering the

organism's resistance to the action of any stimuli, including, of course, pathogenic stimuli. It is important to note here that dysfunction of any of the endocrine glands is always associated with changes in the functions of the central nervous system [and, of course, with other endocrine glands]. Historically, endocrine regulation of the organism was the only system of regulation of functions at the stages of evolutionary development of the animal world, at which there was as yet no nervous system. The development of the nervous regulation, however, did not terminate hormonal regulation, the two aspects of regulation combining to form the neuroendocrine system.

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Rhythm is all pervading. Rhythm is everywhere. The life of the Universe, like that of any physical or any social phenomenon, is essentially rhythmical. Available evidence suggests that about fifty of our physiological processes follow daily cycles. One example is the blood cortisone level, which peaks at eight in the morning. It is further suggested that hours of the day, namely 11 am and 5 - 10 pm, are particularly suited for making a decision and taking up a serious job. So everything in the world obeys rhythms. Yet it is only recently that scientists have realized that the mysterious rhythm controls operate on the pendulum principle. In other words, the rhythmical processes gradually develop in intensity, reach a maximum, roll back to a minimum, and pick up again. The pendulum principle governs the operation of practically our entire organism, down to its every cell. The phenomenon, though simple at first glance, exhibits one interesting pattern: the farther the pendulum swings to one side, the stronger it will move to the other. Most importantly, the

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principle holds in the sphere of emotion, which was recently discovered by neurophysiologists to be linked with the subcortex of the brain. If the region in the cat's brain responsible for negative emotions, for example, is properly stimulated the animal is thrown for a few minutes into a state of fear and frenzy. But some time after the stimulation is ceased and the wave of the negative emotions has receded, the animal becomes "abnormally" gentle as its positive emotions take over. In humans very similar state can be observed. The deliberate stimulation of emotions with alcohol, for example causes the inevitable. Some time later tension, anxiety, alarm, depression and a nasty feeling of ill-being then afflicts the drinker. Any addiction to stimulants of the subcortex of the human brain can be traced to such artificial "swing" of the physiological pendulum.

However, the effective range of the physiological rhythms is not restricted to the sphere of elementary emotions. Indeed our internal "pendulums" influence all facets of our psychological processes. A basic understanding of these processes, and, more importantly, of how to put them to advantage holds vast potential for intensifying creative performance. The all too familiar expressions "he is at his best today" and "he is in good shape now" relate actually to the optimum condition of the person's emotions. The sense of well-being, self confidence, maximum productivity and overwhelming success are all inherent in these states, no matter when, how, and in whom they come to pass. Everyone, but especially people with creative skills, ought to be aware of the skills, ought to be aware of the probable anticlimax after a period of emotional uplift, it ought never to confound them. Moreover, with a reasonable good knowledge of the mechanics of emotions, these

ups and downs can be integrated into one's work planning. What is, for example, the best way to manage our mental and physiological upswings? Presumably, by working at the peak of one's abilities, up to one's full potential. What about the periods when this potential falls back? You should simply not let them wreck your good humour. But neither should you force nature by artificially hyping your brain with drugs or stimulants.

Using microelectrodes to investigate a rat's subcortex neurophysiologists discovered, somewhat unexpectedly, that there are brain sites with directly opposite properties. When current was applied to sites the neurophysiologist termed "areas of hell", the animal experienced pain and displeasure. Current applied to the "areas of paradise" made the animal apparently feel immense pleasure and calmed down. A circuit was instructed so that a rat could send electrical pulses into its brain, and the animal, as if in ecstasy, kept pressing the "pleasure" pedal for 20 to 25 hours on end until it fell exhausted.

More recently, "hell", and "paradise" areas have been located in the brains of dogs, monkeys and humans. Implanted electrodes studies of human patients have shown that the electrical stimulation of deep-seated cerebral structures can cause pleasurable sensations borne out by the patients, own accounts, their facial expressions, behaviour, and the desire that the stimulation be repeated. The patients visibly changed with the emergence of bright moods, a sense of well-being, and total comfort. Some were relaxed and smiling all the time, while others laughed uproariously and enjoyed themselves. All positively relished the stimulation and asked for it to be continued. On the other hand, stimulation

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of other regions, conversely produced uncomfortable feelings of anxiety, sadness, despondency, fear, an emotional burst. What is the relationship, if any, between this neurophysiological discovery and the pendulum principle in the operation of the human brain? The detection in the human brain of two dynamically interconnected brain centres responsible for comfort and discomfort has given neuropsychiatrists an understanding of the causes for some mental disorders and clues to the neurophysiological nature of drug abuse, perhaps the most mysterious and devastating of the human psychological functions. Thus, nature in its wisdom has tied the "paradise" and "hell" structures together through a negative feedback relation. Whenever the "volume of pleasure" received by the brain grows beyond the allowable limits a danger signal is sent into the "hell" area and the pleasure gives place to displeasure, bringing the process to a halt. But this pattern holds only in the normal brain for which the "paradise-hell" pendulum cannot easily swing wider. In a morbid or easily excitable brain this relationship between the "hell" and "paradise" brain areas is impaired. The balance of the two brain systems is unstable and "paradise" and "hell" brain's regions exist at a higher than normal state of excitation. We know that mentally ill people are painfully vulnerable, it is as though they have raw nerves. On the other hand, all too frequently we witness an enhanced and unrestrained desire for obtaining pleasure. Here we approach the drug addiction problem, that is, the deliberate displacement of the "pendulum" of the human brain. The "paradise" can be induced and the "hell" suppressed - apart from environmental physical factors [e.g. a burn, bonding and other familiar sources of comfort or discomfort like food, pain, nice music, noise, etc.] by a narcotic, a very potent artificial

stimulus of the "paradise" and depressant [inhibitor] of the "hell". These substances, to be found in tobacco, coffee, morphine, and alcohol, are extremely powerful in either suppressing "discomfort" such as pain or conversely, in producing "comfort".

There are people with a malfunctioning "paradise - hell" brain mechanism. The malfunctions develop more typically from nervous breakdowns and brain injuries which also abound in our nerve-racking dynamic age. As a result, these sufferers experience an ever-present hunger for something to sustain their "paradise" brain areas. After once savouring a "narcotic delight" -even a low dose- the "paradise" begins to demand: More! More! And since its relationship with the "hell" brain region is disturbed, the craving remains unabated and the narcotic hunger gets more and more pressing. The person enlarges the intake and turns into a drug addict: be it as an alcoholic, opium or tobacco smoker, or what have you. In other words, the "comfort - discomfort" brain pendulum is pushed dramatically over to the "comfort" side. The organism gets used to the extra "fuel" and protests with pain to any attempt to lower the dosage. Moreover, the brain is fairly quick to adapt to the drug doses it receives so that to maintain the induced pleasurable state at the "habitual level", the addict has to take progressively larger doses. As a result, an organism that has long been "energized" with a current of continuous agitation falls prey to catastrophic disruptions. Any attempt to whip up one's brain artificially may result in irreversible damage to the brain pendulum character of the psychological processes. A relevant example is cigarette smoking, a minor case of "drug abuse". Tobacco seems to be a mild narcotic, but nevertheless it has a certain galvanizing effect on the "paradise" brain area, causing a

### *General Concluding Remarks*

certain flamboyant, if false sensation of new vitality and increased working capacity. But, much like any other narcotic, tobacco slowly but steadily draws the smoker into the whirlpool of addiction. The more cigarettes a smoker consumes, the stronger he pushes the "hell - paradise" pendulum of his brain in the "paradise" direction, and the greater suffering the "hell" region will cause him should he try to stop smoking. This is why inveterate smoker finds it hard to drop the pernicious habit abruptly. Conscious of the "pendulum" character of drug abuse, neuropsychiatrist came up with the principle of gradually stepping down the daily number of cigarettes. So far the results have been quite encouraging.



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**Professor Nouri Jaffar**  
was born in Iraq in  
1914. He received his  
M.Sc. and Ph.D.  
degrees from Ohio State  
University. He is now  
Professor Emeritus at  
Baghdad University. He  
is the author of many  
books and articles in  
the fields of Education  
and Neuropsychology.

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